S-10 ELECTRIC SERVICE MANUAL

1998

GMET/98-ST-1

Book 1

Includes:
General Information,
HVAC, Electrical,
Accessories
and Body

CAUTION

In order to reduce the chance of personal injury and/or property damage, carefully observe the instructions that follow:

Service information provided by General Motors Corporation is intended for use by professional, qualified technicians. Attempting repairs or service without the appropriate training, tools, and equipment could cause injury to you or others. This could also damage the vehicle, or cause the vehicle to operate improperly.

Proper vehicle service and repair are important to the safety of the service technician and to the safe, reliable operation of all motor vehicles. If you need to replace a part, use the same part number or an equivalent part. Do not use a replacement part of lesser quality.

The service procedures we recommend and describe in this manual are effective methods of performing service and repair. Some of the procedures require the use of tools that are designed for specific purposes.

Accordingly, any person who intends to use a replacement part, a service procedure, or a tool that is not recommended by General Motors, must first establish that there is no jeopardy to personal safety or the safe operation of the vehicle.

This manual contains *CAUTIONS* that you must observe carefully in order to reduce the risk of injury to yourself or others. This manual also contains *NOTICES* that must be carefully followed in order to avoid improper service that may damage the vehicle, or damage tools or equipment. These *CAUTIONS* and *NOTICES* are not exhaustive. General Motors can not possibly warn of all the potentially hazardous consequences of your failure to follow these instructions.

If the vehicle being serviced is equipped with a Supplemental Inflatable Restraint (SIR), refer to the *CAUTIONS* in the following service manual section/service category type before performing a service on or around SIR Components or wiring:

- Sub-Section 9J - Supplemental Inflatable Restraints, refer to *CAUTIONS* under On-Vehicle Service and the SIR Component Wiring Location view, or,
- Section - Body and Accessories, Sub-Section - Restraints, refer to *CAUTIONS* under On-Vehicle Service and the SIR Component Wiring Location view.

Failure to follow these *CAUTIONS* could cause air bag deployment, personal injury, or otherwise unneeded SIR repairs.

In order to help avoid accidental air bag deployment and personal injury, whenever you service a vehicle that requires repair of the SIR and another vehicle system, we recommend that you first repair the SIR, then go on to the other system.

HIGH VOLTAGE SAFETY

CAUTION: DC and AC High Voltage. To help avoid injury, always follow the service manual procedures and manually disconnect the high voltage system before working on or around it.

The S-10 Electric Truck has both high-voltage DC and AC systems, as well as a 12-volt system. DC and AC high-voltage are both very dangerous and can cause severe burns and shock. You first need training about how to repair the S-10 Electric Truck and then must follow the proper repair procedures to minimize the risk.

Currents as low as 0.5 mA AC or 2 mA DC can cause injuries under some conditions. The potential for injury depends on the current path through the body, the amount of current and how long the current flows through the body. Other factors that influence the effect of current are the body's impedance, the frequency of the current, the moisture level of the skin, the size of the contact area, the pressure exerted, temperature, and the physiological characterists of the individual.

AC and DC high-voltage affect the body differently. The varying current with AC high-voltage is more traumatic to the body and can also prevent letting go of the electrodes.

The high-voltage system is independent and isolated from the 12-volt system. When a failure is detected, the high-voltage system is automatically disconnected. There is also a manual disconnect that must be used before service work is performed on or around the high-voltage system.

To help avoid injury:

- Do not work on the S-10 Electric Truck without training. Even the greatest gasoline engine technician needs training for this truck.
- Follow the service manual procedures and cautions.
- ALWAYS assume that high voltage is present.
- To prevent current from having a path through your body, use one hand to do an operation on the high-voltage system.
- Use electrical tape to cover all metal parts of your tools to reduce the chance that the tools will complete a current path.

The battery pack has at least 25 times the energy of one regular automotive battery. Extra precautions are required when the battery pack is removed from the vehicle because the automatic and manual disconnect cannot protect you from a disconnected battery pack. Follow the service manual procedures and cautions.

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Mixed Style Service Manual Structure

This service manual is a mix of the old style GM service manual and the new style that will be completely transitioned for the 1999 model year. For 1998 this manual consists of three volumes. The following table shows the section content by volume and the style the information was written in.

Volume 1		Volume 2		Volume 3	
0 - General Information	New	2 - Steering	Old	6 - Engine	New
1 - HVAC	Old	3 - Suspension	New	7 - Transmission/Transaxle	New
8 - Chassis/Body Electrical	Old	4 - Driveline/Axle	New		
9 - Accessories	Old	5 - Brakes	New		
10 - Body	Old				

Another change to the old style sections is that all of the sub-section Table of Contents have been brought forward to the front of the section and the information is listed in book order for that section. These Table of Contents have been enhanced and are to be used to locate information in those sections as there are not index entries in the Index for the old style sections.

The following table gives the previous service manual sub-sections with the name of the new section and sub-section. If a section is new style, it will contain the diagnosis that was previously in Section 8A. Also, Seat Belts and SIR is found in Sub-Section 9J in Accessories this year.

Please bear with us through this transition year. We hope the information found in the following tables and the enhanced Table of Contents will enable you to more easily find the information you need.

Truck Service Manual Sub-Section to Section and Sub-Section Conversion Table

Old Sub-Section	Old Sub-Section	New Section	Section Name	Sub-Section Name
0A	General Information	Preface	Cautions and Notices	Cautions and Notices
0A	General Information	0	General Information	General Information
0B	Maintenance and Lubrication	0	General Information	Maintenance and Lubrication
0C	Vibration Diagnosis	0	General Information	Vibration Diagnosis
1A	Heating and Ventilation	1A	HVAC	Heating and Ventilation
1B	Heating, Ventilation, and Air Conditioning	1B	HVAC	Heating, Ventilation, and Air Conditioning
1D2	A/C Compressors	1D2	HVAC	A/C Compressors
2A	Frame and Bumpers	10A5	Body	Frame and Bumpers
2B	Sheet Metal	10A6	Body	Sheet Metal
3A	Front Wheel Alignment	3	Suspension	Wheel Alignment
3B	Power Steering Gear and Pump	2B	Steering	Power Steering Gear and Pump
3B1A	Power Steering Gear Unit Repair	2B1A	Steering	Power Steering Gear Unit Repair
3B1B	Power Steering Pump Unit Repair	2B1B	Steering	Power Steering Pump Unit Repair
3B3	Steering Linkage	2B3	Steering	Steering Linkage
3C	Front Suspension	3	Suspension	Front Suspension
3D	Rear Suspension	3	Suspension	Rear Suspension
3E	Tires and Wheels	3	Suspension	Tires and Wheels
3F	Steering Columns	2F	Steering	Steering Wheel and Column
4A	Propeller Shaft	4	Driveline/Axle	Propeller Shaft
4B1, 4B2, 4B3, 4B4, 4B5, 4B7	Rear Axle and Differential	4	Driveline/Axle	Rear Drive Axle
4C, 4C2	Front Drive Axles and Differential	4	Driveline/Axle	Front Wheel Drive Shafts and Front Drive Axle
4D1	Drive Axle Unit Repair	4	Driveline/Axle	Rear Drive Axle
5A	Hydraulic Brakes	5	Brakes	Hydraulic Brakes
5A1, 5A1A	Master Cylinder	5	Brakes	Hydraulic Brakes
5B1	Front Disc Brakes	5	Brakes	Disc Brakes
5B2	Rear Disc Brakes	5	Brakes	Disc Brakes
5C1	Leading/Trailing Drum Brakes	5	Brakes	Drum Brakes
5C2	Duo-Servo Brakes	5	Brakes	Drum Brakes
5D1, 5D2, 5D2A	Hydraulic or Vacuum Booster	5	Brakes	Hydraulic Brakes
5F	Parking Brake	5	Brakes	Parking Brake
5E	Antilock Brakes	5	Brakes	Antilock Brakes

Truck Service Manual Sub-Section to Section and Sub-Section Conversion Table (cont'd)

Old Sub-Section	Old Sub-Section	New Section	Section Name	Sub-Section Name
6, 6A	Engine Mechanical	6	Engine	Engine Mechanical
6B	Engine Cooling and Radiator	6	Engine	Engine Cooling
6D	Engine Electrical	6	Engine	Engine Electrical
—	Driveability and Emissions	6	Engine	Engine Controls
6F	Exhaust System	6	Engine	Exhaust System
6H	Vacuum Pump	6	Engine	Vacuum Pump
6J	Turbocharger	6	Engine	Turbocharger
7A	Automatic Transmission	7	Transmission/Transaxle	Automatic Transmission, and Transmission/Transfer Case Unit Repair Manual
7B	Manual Transmission	7	Transmission/Transaxle	Manual Transmission, and Transmission/Transfer Case Unit Repair Manual
7C	Clutch	7	Transmission/Transaxle	Clutch
7D	Transfer Case	4	Driveline/Axle	Transfer Case, and Transmission/Transfer Case Unit Repair Manual
8A	Electrical Diagnosis	8A	Electrical Diagnosis	Electrical Diagnosis
8B	Lighting Systems	8B	Body	Lighting Systems
8C	Instrument Panel and Gauges	8C	Body	Instrument Panel and Gauges
8D	Chassis Electrical	8D	Body	Chassis Electrical
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8E2	Rear Window Wiper Washer System	8E2	Body	Rear Window Wiper Washer System
9A	Audio Systems	9A	Body	Audio Systems
9B	Cruise Control	9B	Body	Cruise Control
9E	Engine Coolant Heater	9E	Engine	Engine Cooling
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9K	Remote Keyless Entry	9K	Body	Remote Keyless Entry
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10A4	Interior Trim	10A4	Body	Interior Trim
10A5	Endgate	10A7	Body	Body Rear End
10B	Cab and Body Maintenance	10B	Body	Sheet Metal

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1998 S-10 Electric Truck Service Manual

Volume 1

This manual provides information on the diagnosis, the service procedures, the adjustments, and the specifications for the 1998 S-10 Electric Truck.

Information on transmission unit repair (overhaul) can be found in the 1998 Transmission/Transaxle/Transfer Case Unit Repair Manual (TURM), GMPT/98-TURM, available separately. The TURM manual contains information on automatic and manual transmissions and transaxles, and transfer cases for all GM passenger cars and light duty trucks, including the fluid flow and circuit description information.

The technicians who understand the material in this manual and in the appropriate Dealer Service Bulletins better service the vehicle owners.

When this manual refers to a brand name, a part number, or a specific tool, you may use an equivalent product in place of the recommended item. All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication approval. General Motors reserves the right to make changes at any time without notice.

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REPORTING ERRORS AND SUGGESTIONS

If you find an error in a GM Service manual, or if you have a suggestion about a GM service manual, we want to hear from you.

When calling, be prepared with the following information:

- Your name
- Your dealership's name
- Your dealership's phone number
- The model year and the vehicle line
- The publication part number (if present)
- The vehicle identification number of the vehicle being worked on
- The service manual section and page number(s)
- Any applicable electronic information element identification numbers
- A descriptive explanation of your concern

The GM service manual phone personnel will respond to your concerns in the following ways:

- By delivering your concern to the manual's author.
- By eliciting a response from the author.
- By supplying you with an answer to your concerns.

For paper manual users: The GM service manual phone personnel will also explain how to send in examples or marked-up pages.

For electronic manual users: Be prepared to provide any applicable identification numbers pertaining to the electronic information that you are questioning.

The GM service manual comment telephone numbers do not provide technical assistance. For technical assistance, contact your regular technical assistance source.

United States and Canada General Motors Dealer Employees
Please call the following number Monday through Friday with your comments: 1-800-828-6860, fax number 810-265-9327, 8:00 a.m.-8:00 p.m. Eastern Time Zone.

Canada, French Speaking General Motors Dealer Employees
Please call the following number Monday through Friday with your comments: 1-800-503-3222, fax number 810-265-9327, 8:00 a.m.-6:00 p.m. Eastern Time Zone.

International English Speaking General Motors Dealer Employees
Please call the following number Monday through Friday with your comments: 810-265-0840, fax number 810-265-9327, 8:00 a.m.-6:00 p.m. Eastern Time Zone.

United States and Canadian Vehicle Owner/Operator
Vehicle owners or operators are encouraged to address their comments and concerns to the applicable Customer Assistance Center. The phone number and address of the Customer Assistance Centers are in the Owner's Manual.

STG

GM ServiceTechnology Group

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CAUTIONS AND NOTICES

Definition of Caution, Notice, and Important

Cautions, Notices, and Importants in the Service Manual

The diagnosis and repair procedures in the GM Service Manual contain both general and specific Cautions, Notices, and Importants. GM is dedicated to the presentation of service information that helps the technician to diagnose and repair the systems necessary for the proper operation of the vehicle; however, certain procedures may present a hazard to the technician if they are not followed in the recommended manner. Cautions, Notices, and Importants are elements designed to prevent these hazards; however, not all hazards can be foreseen. This information is placed at strategic locations within the service manual. This information is designed to prevent the following from occurring:

- Serious bodily injury to the technician
- Damage to the vehicle
- Unnecessary vehicle repairs
- Improper repair or replacement of vehicle components. Any caution or notice that appears in General Information is referenced from the individual service categories.

CAUTION Defined

When encountering a CAUTION, you will be asked to take a necessary action or not to take a prohibited action. If a CAUTION is not heeded, the following consequences may occur:

1. Serious bodily injury to the technician.
2. Serious bodily injury to other technicians in the workplace area
3. Serious bodily injury to the driver and/or passenger(s) of the vehicle, if the vehicle has been improperly repaired.

NOTICE Defined

Notices call for special attention to a necessary action or to a prohibited action. If a NOTICE is not heeded, the following consequences may occur:

- Damage to the vehicle
- Unnecessary vehicle repairs
- Unnecessary component replacement
- Improper operation or performance of the system or component under repair
- Damage to any systems or components which are dependent upon the proper operation of the system or component under repair.
- Improper operation or performance of any systems or components which are dependent upon the proper operation or performance of the system or component under repair
- Damage to fasteners, basic tools, or special tools
- The leakage of coolant, lubricant, or other vital fluids.

IMPORTANT Defined

IMPORTANT statements emphasize a necessary characteristic of a diagnostic or repair procedure. IMPORTANT statements are designed to do the following:

- Clarify a procedure
- Present additional information for accomplishing a procedure
- Give insight into the reason or reasons for performing a procedure in the manner recommended
- Present information that will help to accomplish a procedure in a more effective manner
- Present information that gives the technician the benefit of past experience in accomplishing a procedure with greater ease

ABS Handling Caution

CAUTION: Certain components in the Antilock Brake System (ABS) are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in personal injury and/or improper system operation. Only those component with approved removal and installation procedures should be serviced.

Battery Disconnect Caution

CAUTION: Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or components.

Brake Dust Caution

CAUTION: Avoid taking the following actions when you service wheel brake parts:

- **Do not grind brake linings**
- **Do not sand brake linings**
- **Do not clean wheel brake parts with a dry brush or with compressed air**

Many earlier model or aftermarket brake parts may contain asbestos fibers which can become airborne in dust. Breathing dust with asbestos fibers may cause serious bodily harm. Use a water-dampened cloth in order to remove any dust on brake parts. Equipment is available commercially in order to perform this washing function. These wet methods prevent fibers from becoming airborne.

Brake Fluid Irritant Caution

CAUTION: Brake fluid may be irritating to the skin or eyes. In case of contact, take the following precautions:

- Eye contact—rinse eyes thoroughly with water.
- Skin contact—wash skin with soap and water.

Electric Coolant Fan Caution

CAUTION: An electric fan under hood can start even when the ignition key is in the OFF position and can injure you. Keep hands, clothing and tools away from any underhood electrical fan.

High-Voltage Caution

CAUTION: DC and AC high-voltage is present. To reduce the risk of severe shocks and burns, the High-Voltage System should be disabled any time service work is being performed on or around the High-Voltage System. When in doubt, always disable the High-Voltage System. The 12-volt system will still be active after the High-Voltage System has been disabled.

Road Test Caution

CAUTION: Road test a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury.

Safety Goggles and Compressed Air Caution

CAUTION: Wear safety glasses when using compressed air in order to prevent eye injury.

Safety Goggles and Fuel Caution

CAUTION: Always wear safety goggles when working with fuel in order to protect the eyes from fuel splash.

Seat Belt Replacement Caution

CAUTION: Replace belts, retractors, and hardware in use during all but a minor collision. Also, restraint systems should be replaced and anchorage's properly repaired if they were in areas damaged by a collision, whether the belt was in use or not. If there is any question, replace the belt system. Damage, whether visible or not, could result in serious personal injury in the event of an accident.

SIR Caution

CAUTION: This vehicle has a Supplemental Inflatable Restraint (SIR) System. Refer to SIR Component Location view in order to determine whether you are performing service on or near the SIR components or the SIR wiring. When you are performing service on or near the SIR components or the SIR wiring, refer to the SIR On-Vehicle Service information. Failure to follow the CAUTIONS could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

SIR Handling Caution

CAUTION: When you are carrying an undeployed inflator module:

- Do not carry the inflator module by the wires or connector on the inflator module
- Make sure the bag opening points away from you

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

SIR Inflator Module Disposal Caution

CAUTION: In order to prevent accidental deployment of the air bag which could cause personal injury, do not dispose of an undeployed inflator module as normal shop waste. The undeployed inflator module contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to dispose of an inflator module as instructed may be a violation of federal, state, province, or local laws.

SIR Special Tool Caution

CAUTION: In order to avoid deploying the air bag when troubleshooting the SIR system, use only the equipment specified in this manual. Failure to use the specified equipment as instructed could cause air bag deployment, personal injury to you or someone else, or unnecessary SIR system repairs.

Vehicle Lifting Caution

CAUTION: To avoid any vehicle damage, serious personal injury or death when components are removed from the vehicle and the vehicle is supported by a hoist, perform the following steps:

- **Chain the vehicle to the hoist at the same end as the components that are being removed**
- **Support for the vehicle at the opposite end from which the components are being removed**

Window Removal Caution

CAUTION: When working with any type of glass, use approved safety glasses and gloves to reduce the chance of personal injury.

Window Retention Caution

CAUTION: When replacing stationary windows, Urethane Adhesive Kit GM P/N 12346284, or a urethane adhesive system meeting GM Specification GM3651M, must be used to maintain original installation integrity. Failure to use the urethane adhesive kit will result in poor retention of the window which may allow unrestrained occupants to be ejected from the vehicle resulting in personal injury.

Work Stall Vibration Test Caution

CAUTION: One or more of the following guidelines may apply when performing specific required tests in the work stall:

- **When a test requires spinning the drive wheels with the vehicle jacked up, adhere to the following precautions:**
  - **Do not exceed 56 km/h (35 mph) when spinning one drive wheel with the other drive wheel stopped. This limit is necessary because the speedometer indicates only one-half the actual vehicle speed under these conditions. Personal injury may result from excessive wheel spinning.**
  - **If all of the drive wheels are spinning at the same speed, do not exceed 112 km/h (70 mph). Personal injury may result from excessive wheel spinning.**
  - **All persons should stay clear of the rotating components and the balance weight areas in order to avois possible personal injury.**
  - **When running an engine in the repair stall for an extrended period of time, use care not to overheat the engine and the transmission.**
- **When a test requires jacking up the vehicle and running with the wheels and brake rotors removed, adhere to the following precautions:**
  - **Do not apply the brake with the brake rotors removed.**
  - **Do not place the transmission in PARK with the wheels still spinning.**
  - **Turn off the ignition in order to stop the powertrain components from spinning.**

Defective Scan Tool Notice

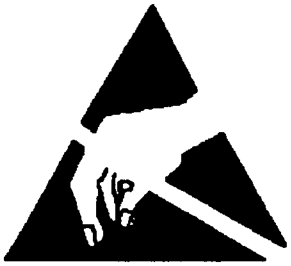
NOTICE: ***Do not use a scan tool that displays faulty data. Report the scan tool problem to the manufacturer. Use of a faulty scan tool can result in misdiagnosis and unnecessary parts replacement.***

Fastener Notice

NOTICE: ***Always use the correct fastener in the proper location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.***

Handling ESD Sensitive Parts Notice

NOTICE



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TO
STATIC ELECTRICITY

CHN0010A

Electrostatic Discharge (ESD) can damage many solid state electrical components. Not all components that are susceptible to damage from ESD are labeled with the ESD symbol. Exercise caution when handling all solid state electrical components Avoid damaging solid state electrical components by taking the following precautions:

- Discharge personal static electricity by touching a metal ground point after each of the following activities:
  - — Slide across the vehicle seat
  - — Sitting or rising
  - — Walking
- Do not touch the exposed electrical terminals on a component with your finger or a tool. The connector that you are checking may be tied into a circuit that is susceptible to damaged by ESD.
- Do not allow a screwdriver or similar tool to contact exposed terminals when disconnecting a connector.
- Do not remove the protective packaging of the solid state component until you are ready to install the solid state component.
- Unless specified in a particular diagnostic procedure, avoid the following activities:
  - — jumpering components or connectors
  - — grounding components or connectors

Sensing and Diagnostic Module (SDM) Notice

NOTICE: ***If the vehicle has been exposed to extensive water intrusion, such as water leaks, window left open, driving through high water and so forth, the Sensing and Diagnostic Module (SDM) and the SDM connector may need to be replaced. With the ignition "OFF," inspect the area under the front seat and the area around the SDM, including the carpet. If any significant soaking or evidence of significant soaking is detected, the water must be removed, water damage repaired and the SDM and the SDM connector MUST be replaced. Before attempting any of these repairs, the SIR system must be disabled. Refer to SECTION 9J under "ON-VEHICLE SERVICE" for instructions on how to disable the SIR system and replace the SDM and SDM connector.***

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SECTION 0A

GENERAL INFORMATION

GENERAL INFORMATION

HIGH VOLTAGE SAFETY

CAUTION: DC and AC high voltage is present. To help avoid injury, always follow the service manual procedures and manually disconnect the high voltage system before working on or around it.

This vehicle has both high voltage DC and AC electrical systems, as well as a 12-volt electrical system. DC and AC voltage are both very dangerous and can cause severe burns and shock. You need training about how to repair these vehicles. You must follow the proper repair procedures to minimize the risk of injury.

Currents as low as 0.5 mA AC or 2 mA DC can cause injuries under some conditions. The potential for injury depends on:

- The current path through the body.
- The amount of current.
- How long the current flows through the body.

Other factors that influence the effect of current are:

- The body's impedance.
- The frequency of the current.
- The moisture level of the skin.
- The size of the contact area.
- The pressure exerted.
- Temperature.
- The physiological characteristics of the individual.

AC and DC high voltage affect the body differently. The varying current with AC high voltage is more traumatic to the body and can also prevent letting go of the electrodes.

The high voltage system is independent and isolated from the 12-volt system. When a failure is detected, the high voltage system is automatically disconnected. There is also a manual disconnect that must be used before service work is performed on or around the high voltage system.

To help avoid injury:

- Do not work on these vehicles without training. Even the most experienced technician needs training for this vehicle.
- Follow the service manual procedures and cautions.
- ALWAYS assume that high voltage is present.
- To prevent current from having a path through your body, use one hand to do an operation on the high voltage system.
- Use electrical tape to cover all metal parts of your tools to reduce the chance that the tools will complete a current path.

The battery pack has at least 25 times the energy of one regular automotive battery. Extra precautions are required when the battery pack is removed from the vehicle because the automatic and manual disconnect cannot protect you from a disconnected battery pack. Follow the service manual procedures and cautions.

GENERAL MOTORS SERVICE MANUAL COMMENTS

If you find an error, or have a suggestion on any General Motors Service Manual, we want to hear from you.

United States (General Motors Dealer Employees Only)

1-800-828-6860

- (Monday—Friday) 8:00 a.m.—8:00 p.m. Eastern Time Zone
- (Friday) 8:00 a.m.—6:00 p.m. Eastern Time Zone

United States And Canadian Vehicle Owner/Operator

If you are the owner or operator of the vehicle, please give your comments to the applicable Customer Assistance Center. The phone number and address are in your Owner's Manual.

SPECIAL TOOL ORDERING INFORMATION

Special service tools shown in this service manual that have tool product numbers beginning with "J" or "BT" are available for worldwide distribution from:

Kent-Moore
SPX Corporation
29784 Little Mack
Roseville, MI 48066-2298
1-800-345-2233
Mon. 8:00 a.m. - Fri. 6:00 p.m. EST, 24 hours a day.
Telex: 244040 KMTR UR
Fax: 810-578-7375

TECH 2 scan tools and accessories can be purchased through Kent-Moore at the above address and phone number.

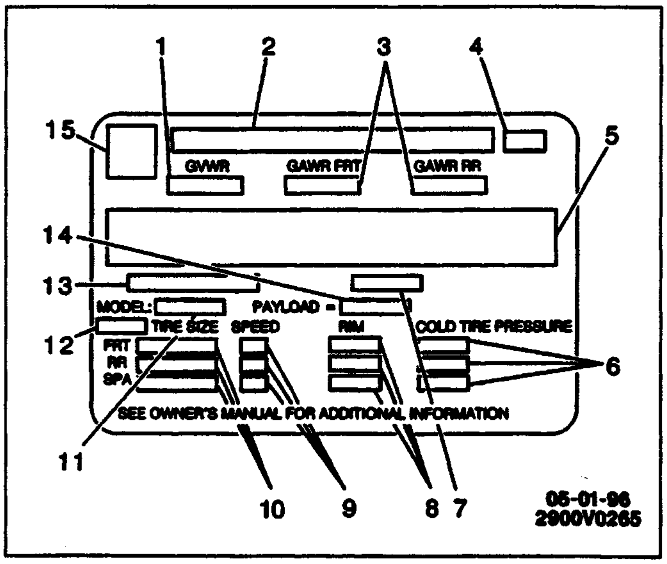
VEHICLE CERTIFICATION LABEL

The vehicle certification label indicates the Gross Vehicle Weight Rating (GVWR), front and rear Gross Axle Weight Rating (GAWR), and the payload rating for the vehicle (Figures 1 and 2).

The Gross Vehicle Weight (GVW) is the weight of the originally-equipped vehicle and all items added to it after it has left the factory. This includes the driver and all occupants; and the load the vehicle is carrying. The Gross Vehicle Weight (GVW) must not exceed the Gross Vehicle Weight Rating (GVWR). Also, the front and rear Gross Axle Weights (GAW) must not exceed the front and rear Gross Axle Weight Rating (GAWR).

The payload rating shown on the label is the maximum allowable cargo load (including the weight of the driver and all occupants) that the vehicle can carry based on all factory installed equipment on the vehicle. The payload rating is reduced if any accessories or other equipment is added to the vehicle after final date of manufacture. The weight of these items should be determined and deducted from the payload rating.

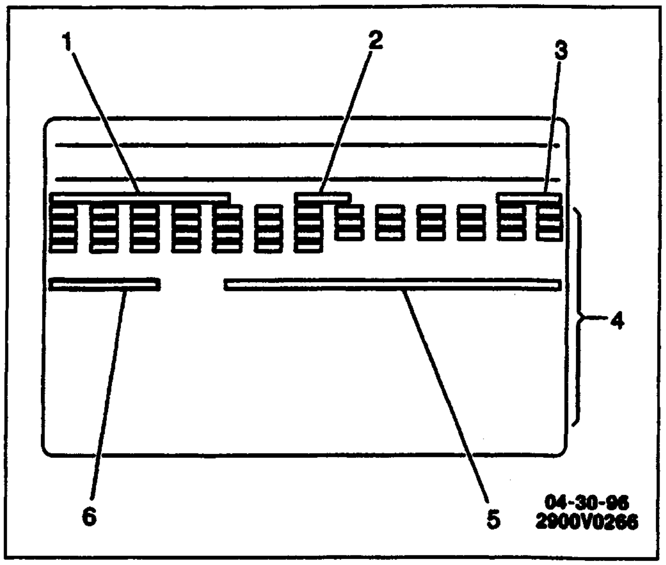
The vehicle may also have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight (GCW) is the total weight of the loaded tow vehicle (including passengers) and a loaded trailer.



Legend

(1) Gross vehicle weight rating
(2) Name of manufacturer
(3) Gross axle weight rating - front and rear
(4) Final manufacturer's date (MO/YR)
(5) Manufacturer's statement
(6) Tire pressure
(7) Model designation
(8) Rim size
(9) Speed rating (when required)
(10) Tire size
(11) Engineering model
(12) GVW rating code
(13) Vehicle Identification Number (VIN)
(14) Payload
(15) Logo

Figure 1—Complete Vehicle Certification Label



Legend

(1) Vehicle identification number
(2) Wheel base
(3) Model designation
(4) RPO/SEO options printed in alpha-numeric sequence
(5) Exterior color (numbers)
(6) Paint technology

Figure 2—Service Parts Identification Label

The tires on the vehicle must be the proper size and properly inflated for the load that the vehicle is carrying. The vehicle certification label shows the originally equipped tire size and recommended inflation pressures. For more information on tires, refer to Tires and Wheels.

FEDERAL VEHICLE THEFT PREVENTION STANDARD

Anti-Theft Labeling

Federal law requires General Motors to label certain parts, on selected vehicles, with the VIN. The purpose

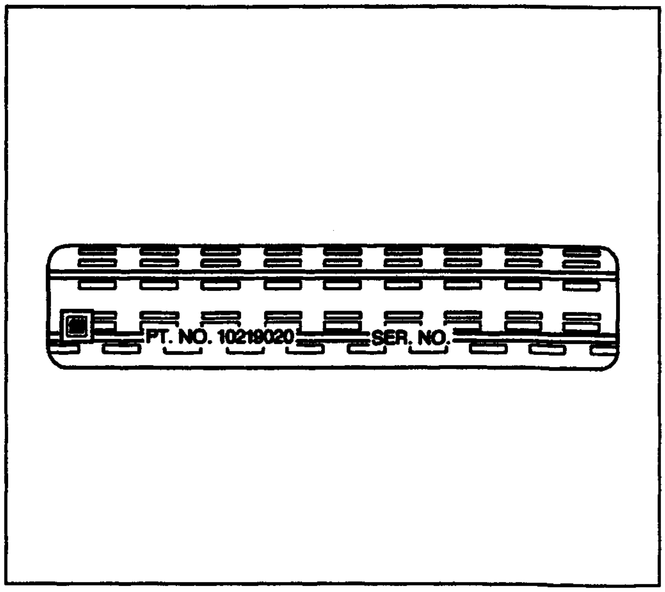


Figure 3—Theft Deterrent Label

of this is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles.

The label will be permanently affixed to an interior surface of the part and will contain the complete VIN. The label on replacement parts will contain the letter R, the manufacturer's logo, and the symbol DOT. Refer to Figure 3 for a sample label.

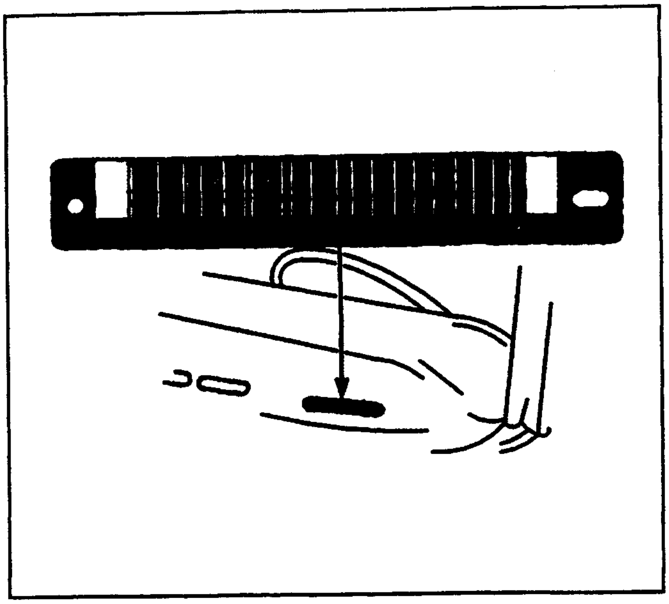


Figure 4—Vehicle Identification Number (VIN) Location

Important

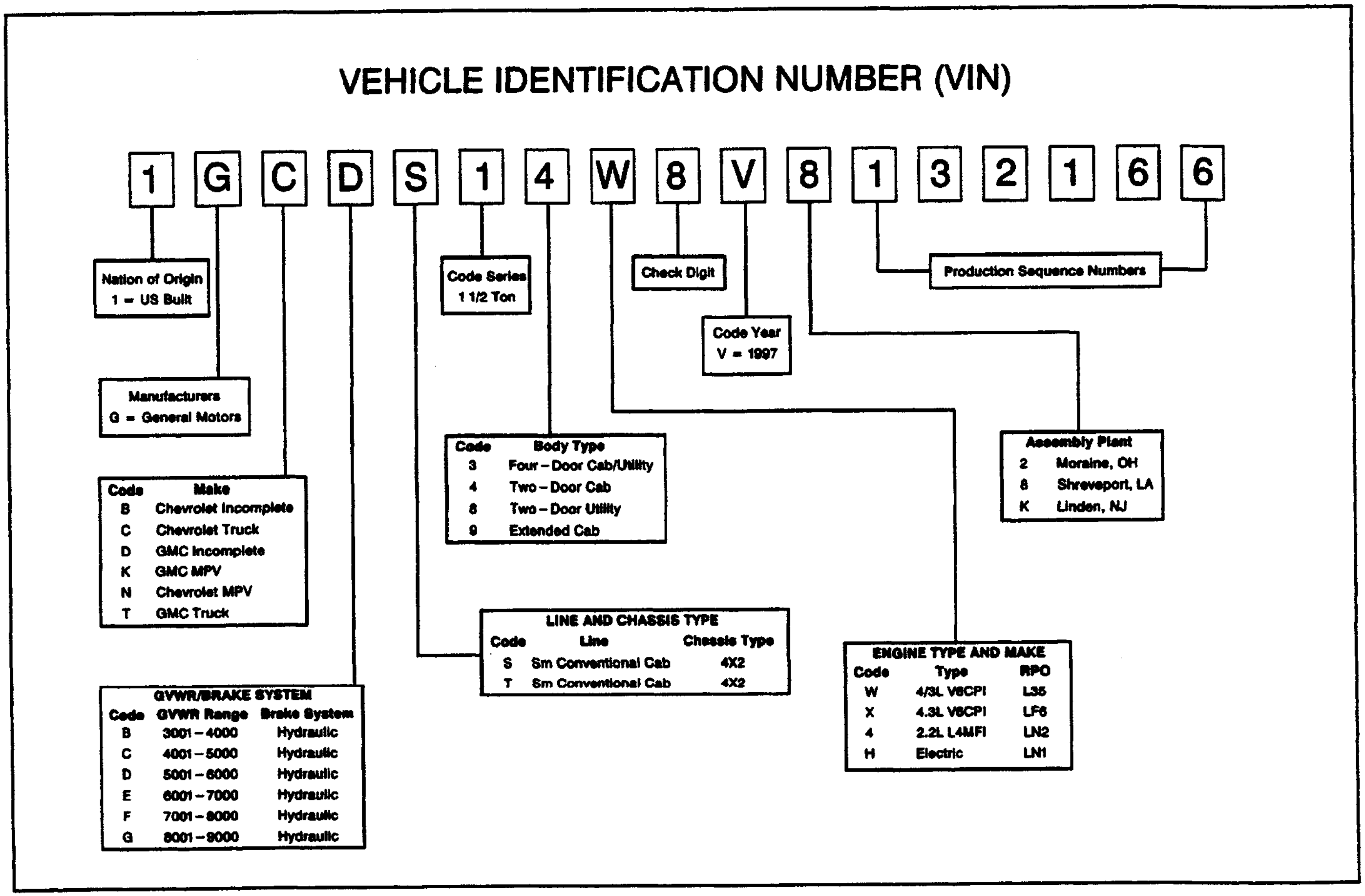
- These labels are NOT to be defaced, removed or covered. The labels MUST be shielded from paint, rustproofing, and undercoating (Dealer preparation included).

NOTICE: ***The anti-theft label found on some major sheet metal MUST be masked prior to painting, rustproofing, undercoating, etc. The mask must be removed after the above operations. Failure to keep the label clean and readable may result in liability for violation of Federal Vehicle Theft Prevention Standard, and subject the vehicle owner to possible suspicion that the part was stolen.***
The parts involved are:

- ***Front and rear bumper assemblies***
- ***Hood***
- ***Doors***
- ***Endgate***
- ***Pickup Box***

VEHICLE IDENTIFICATION NUMBER (VIN)

The vehicle identification number (VIN) is the seventeen digit legal identifier of the vehicle. It is located on a plate attached to the left upper edge of the instrument panel, and can be seen through the windshield (Figure 4). To find the manufacturer, model and chassis



Code	Make
B	Chevrolet Incomplete
C	Chevrolet Truck
D	GMC Incomplete
K	GMC MPV
N	Chevrolet MPV
T	GMC Truck

GVWR/BRAKE SYSTEM

Code	GVWR Range	Brake System
B	3001–4000	Hydraulic
C	4001–5000	Hydraulic
D	5001–6000	Hydraulic
E	6001–7000	Hydraulic
F	7001–8000	Hydraulic
G	8001–9000	Hydraulic

LINE AND CHASSIS TYPE

Code	Line	Chassis Type
S	Sm Conventional Cab	4X2
T	Sm Conventional Cab	4X2

Code	Body Type
3	Four–Door Cab/Utility
4	Two–Door Cab
8	Two–Door Utility
9	Extended Cab

ENGINE TYPE AND MAKE

Code	Type	RPO
W	4/3L V6CPI	L35
X	4.3L V6CPI	LF6
4	2.2L L4MFI	LN2
H	Electric	LN1

Assembly Plant

2	Moraine, OH
8	Shreveport, LA
K	Linden, NJ

Figure 5—Vehicle Identification Number Breakdown

type, engine type, GVW (Gross Vehicle Weight) range, model year, plant code, and sequential number, refer to the Vehicle Identification Number Breakdown (Figure 5).

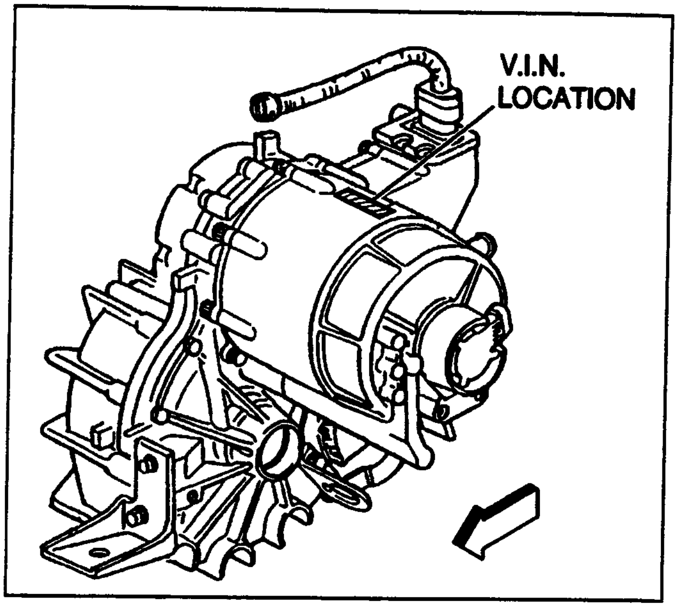


Figure 6—Drive Unit Identification Number Location

DRIVE UNIT IDENTIFICATION NUMBER

All drive units are stamped with an identification number. The stamping contains eight positions (Figure 6).

The VIN will also provide drive unit identification by the drive unit code letter stamped on the vehicle VIN plate in the eighth position.

GENERAL VEHICLE LIFTING AND JACKING

The lift points described in the following paragraphs are shown in Figure 7. The jack and hoist lift points for the front end, are the frame rails between the front body mounts (C) and the transmission crossmember. The vehicle jack and hoist lift points for the rear end, are the front hangers for the rear springs (D).

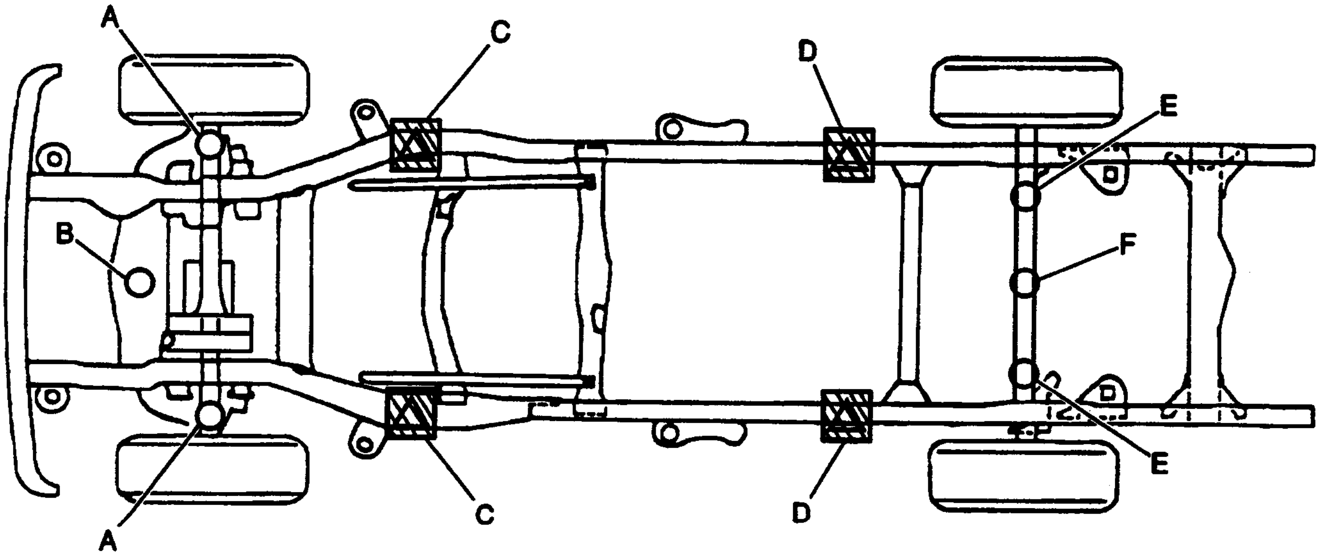


Figure 7—Vehicle Lifting Points

The front end lift points for the floor jack are under the lower control arms (A), inboard from the ball joints. The front end can also be lifted with a floor jack located at the center of the front crossmember (B).

The rear end of the vehicle can be lifted with a floor jack. Lift on the axle housing inboard from the shock absorber mounts (E). Also, the rear end can be lifted using a floor jack in the center of the rear axle.

Anytime a vehicle is lifted at one end using a vehicle jack or a floor jack, the wheels at the opposite end must be blocked. Place the jack stands under the frame (C, D), the front suspension crossmember (B) or the axle for support (F).

When removing major components from the vehicle while the vehicle is on a hoist, the vehicle frame must be chained to the hoist pads in order to prevent tip-off.

NOTICE: ***When jacking or lifting a vehicle, make sure that the lift pads do not contact the brake pipes, brake cables, or fuel pipes. This contact may result in damage or unsatisfactory vehicle performance.***

LOCK CYLINDER CODING

Key Identification And Usage

These vehicles use a one-key locking system. A single, two-sided key operates the ignition, all doors, and any lockable storage compartments. This key is reversible and can be inserted with either side facing up.

NOTICE: ***Tumbler's used on 1995 - 1998 model year vehicles are NOT interchangeable with tumblers used on previous model years.***

Key code information is provided on an alpha-numeric bar-coded tag attached to the key ring This tag accompanies the vehicle to the dealership. If the key code is not attached, contact Roadside Assistance to obtain it. You will need the 17 digit vehicle identification number in order to receive the key code.

Once the key code is identified, the lock combination can be determined using a coded list. This list is available from key cutting equipment suppliers.

Cutting Keys

1. Determine the key blank code from the code list.
2. Cut a blank key to the proper level for each of six tumbler positions.
3. Check the key operation in the lock cylinder.

Replacement Lock Cylinders

Lock cylinders are available from service parts warehouses. The new cylinder has a locking bar staked in place. Tumblers are also available and must be assembled into the cylinder.

Assembling And Coding Lock Cylinders

Ignition Lock Cylinders

Ignition tumblers are shaped exactly alike with the exception of two notch positions on the key shank. As the key is inserted in the lock cylinder, tumblers are lowered to the correct heights so that notches on each tumbler are at the same level. When the notches on all tumblers line up, the side bar is pushed into the notches by two small springs. This allows the cylinder to turn in its bore. Four types of tumblers result in various lock combinations. Each tumbler is coded according to a number, 1 through 4, stamped on its side.

Assemble

1. Determine the tumbler numbers and arrangement.
   - With the numerical key code, use the code list provided by a key cutting equipment supplier.
   - Without the numerical key code or without a code list, read the key code diagram in (Figure 8).
     A. Lay the key on the key code diagram. Make sure the key is outlined by the diagram.
     B. Start with position number one. Find and record the lowest level (tumbler number) that is visible. Repeat for each of the remaining five positions.

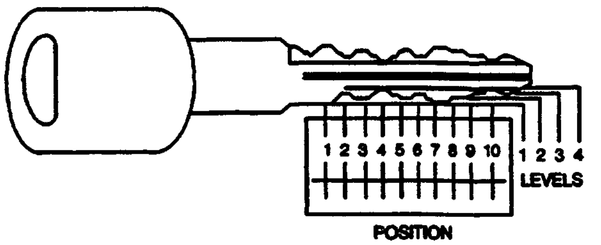


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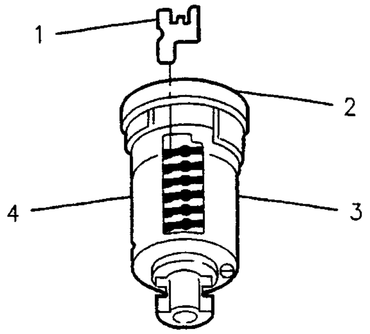
Figure 8—Key Code Diagram



1 TUMBLER
2 LOCK CYLINDER HEAD
3 LOCK CYLINDER
4 SIDE BAR

Figure 9—Installing Tumblers

2. Starting with position one (the open end or head of the cylinder), insert tumblers in their proper slots in the order called for by the code (Figure 9).
3. Pull the side bar out so that the tumblers will drop completely into place.
4. Insert one tumbler spring above each tumbler.
5. Insert the spring retainer so that the end prongs slide into the slots at each end of the cylinder. Press the retainer down (Figure 10).
6. Insert the key into the lock cylinder to check for proper installation. If the tumblers are installed properly, the side bar will drop down. If it doesn't, take the cylinder apart and reassemble it.
7. Remove the key.
8. Place the J 41340-1 Holding Fixture in vise (Figure 10).
9. After the proper tumblers, springs and retaining cap have been installed in the lock cylinder, slide lock cylinder into the holding fixture so that the spring retainer can be accessed through the open slot in the fixture. The cylinder head must set tight against the face of the holding fixture.
10. Tighten the retaining screw on holding fixture to hold cylinder in place.
11. Position the flat side of the J 41340-2 Staking Tool against lock cylinder head and strike staking tool with hammer so that material from the cylinder overlaps the corners of the retainer (Figure 10).
12. Turn the Staking tool 180 degrees so that the flat side faces the other end of the slot. Position the blade of the J 41340-2 Staking Tool against the back of slot on fixture and strike staking tool with hammer as in previous step (Figure 10).
13. Remove lock cylinder from holding fixture.
14. Lock cylinders should be lubricated with GM multi-purpose lubricant GM P/N 12346241.

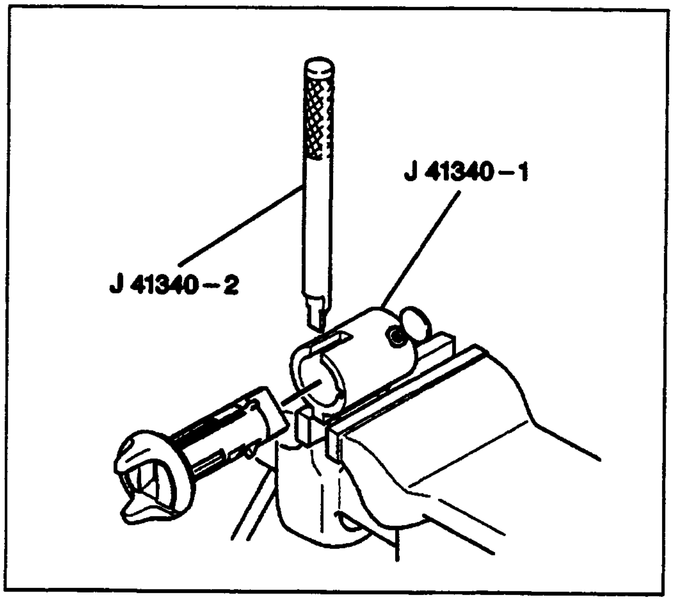
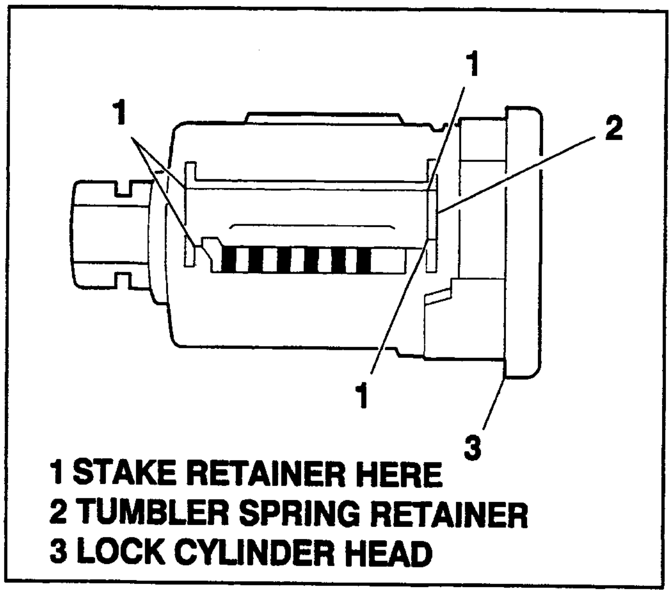


Figure 10—Cylinder Holding Fixture and Staking Tool



1 STAKE RETAINER HERE
2 TUMBLER SPRING RETAINER
3 LOCK CYLINDER HEAD

Figure 11—Locking Tumblers in Place

All Other Lock Cylinders

Lock cylinders with snap-in tumblers are used for all locks except the ignition. The lock cylinder has four or five tumbler positions. The number 1 or 2 position (closest to the cylinder head) is a brass retainer tumbler. The 2 through 5 positions or 3 through 5 positions are standard tumbler positions depending on cylinder type. Therefore, only the last 4 or 5 tumbler combinations are required. To assemble the lock cylinder, determine the tumbler numbers and arrangement, as previously described, and install the tumblers.

METRIC FASTENERS

Current model GM vehicles are primarily dimensioned in the metric system. Many fasteners are metric and are very close in dimension to well-known customary fasteners in the inch system. It is very important that replacement fasteners be of the correct nominal diameter, thread pitch, and strength.

Original equipment metric fasteners (except "beauty" bolts, such as exposed bumper bolts, and cross-recess head screws) are identified by a number or marking indicating the strength of the material in the fastener as outlined later. Metric cross-recess screws are identified by a Posidrive or Type 1A. Either a Phillips head or Type 1A cross-recess screwdriver can be used in Posidrive recess screw heads, but Type 1A cross-recess screwdrivers will perform better.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 9.8 and 10.9 with the class identification embossed on the head of each bolt. Some metric nuts will be marked with single digit strength identification numbers on the nut face.

When replacing metric fasteners, use bolts and nuts of the same strength (or greater) as the original fasteners (the same number marking or higher). Likewise, select replacement fasteners of the correct size. Correct replacement metric fasteners available in the aftermarket parts channels were designed to metric standards of countries other than the United States. They may be of a lower strength, may not have the numbered head marking system, and may be of a different thread pitch.

The metric fasteners used on GM products are designed to new, international standards that may not yet be followed by some non-domestic bolt and nut suppliers.

PREVAILING TORQUE FASTENERS

A prevailing torque nut is designed to develop an interference between the nut and bolt threads. This is most often accomplished by distortion of the top of an all-metal nut by using a nylon patch on the threads in the middle of the hex flat. A nylon insert may also be used as a method of interference between nut and bolt threads.

A prevailing torque bolt is designed to develop an interference between bolt and nut threads, or the threads of a tapped hole. This is accomplished by distorting some of the threads or by using a nylon patch or adhesive.

Recommendations For Reuse:

1. Clean, rust free prevailing torque nuts and bolts may be reused as follows:
   - A. Clean dirt and other foreign material off the nut or bolt.
   - B. Inspect the nut or bolt to ensure there are no cracks, elongation, or other signs of abuse or over tightening. (If there is any doubt, replace with a new prevailing torque fastener of equal or greater strength.)
   - C. Assemble the parts. Hand start the nut or bolt.
   - D. Observe that, before fastener seats, it develops the proper torque. (If there is any doubt, replace with a new prevailing torque fastener of equal or greater strength.)
   - E. Tighten the fastener to the torque specified in the appropriate section of this manual.
2. Bolts and nuts that are rusty or damaged should be replaced with new parts of equal or greater strength.

SYMBOLS, ABBREVIATIONS AND ACRONYMS

A—Ampere
AC—Alternating Current
A/C—Air Conditioning
ADJ—Adjust
Alt—Altitude
ANT—Antenna
AP—Accelerator Pedal
ASM—Assembly
AT—Automatic Transmission
Auth—Authority
Auto—Automatic
APP—Accelerator Pedal Position Sensor
APCM—Accessory Power Control Module
BARO—Barometric Pressure
Bat—Battery
BCA—Bias Control Assembly
B+—Battery Positive Voltage
BP—Back Pressure
°C —Degrees Celsius
Calif—California
CD—Compact Disc
CE—Commutator End
CFI—Continuous Fuel Injection
CID—Cubic Inch Displacement
CL—Closed Loop
CO—Carbon Monoxide
Coax—Coaxial
Conn—Connector
Conv—Converter
CV—Constant Velocity
Cyl—Cylinder(s)
DC—Direct Current
DE—Drive End
DLC—Data Link Connector
DRL—Day Time Running Lamps
DTC—Diagnostic Trouble Code
DTM—Diagnostic Test Mode
DVM—Digital Voltmeter
EAC—Electric Air Control
EAS—Electric Air Switching
EEPROM—Electronically Erasable Programmable Read Only Memory
EPROM—Erasable Programmable Read Only Memory
ESC—Electronic Spark Control
ESD—Electrostatic Discharge
ETR—Electronically Tuned Receiver
EVAP—Evaporative Emission
EXH—Exhaust
4WAL—Four Wheel Antilock Brakes
° F—Degrees Fahrenheit
FC—Fan Control
FED—Federal (All States Except Calif.)
FFH—Fuel Fired Heater
GAL—Gallon
GEN—Generator
Gov—Governor
g—Gram
GND—Ground
Harn—Harness
HC—Hydrocarbons
HD—Heavy Duty
Hg—Mercury
HiAlt—High Altitude
HO2S—Heated Oxygen Sensor
HTCM—Heater Ventilation Air Conditioning Thermal Control Module
ID—Identification or Inside Diameter
IP—Instrument Panel
IPC—Instrument Panel Cluster
INT—Intake
ISC—Idle Speed Control
km—Kilometer
km/h—Kilometer per hour
kPa—KiloPascals
KS—Knock Sensor
kV—Kilovolts (thousands of volts)
L—Liter
LLC—Long Life Coolant
LF—Left Front
LH—Left Hand
LR—Left Rear
LS—Left Side
MAF—Mass Air Flow

MAN—Manual
Max—Maximum
MDP—Manifold Differential Pressure
MIL—Malfunction Indicator Lamp
Min—Minimum
mL—Milliliter
mm—Millimeter
MPH—Miles Per Hour
mV—MilliVolt
NC—Normally Closed
N·m —Newton Meters
Ox—Nitrogen, Oxides of
NVRAM—Non-Volatile Random Access Memory
OBD—On Board Diagnostic (level 1)
OBDII—On Board Diagnostic (level 2)
OD—Outside Diameter
OL—Open Loop
O2—Oxygen
O2S—Oxygen Sensor
P/B—Power Brakes
PNP—Park/Neutral Position
PIM—Power Inverter Module
PRESS—Pressure
PROM—Programmable Read Only Memory
PS—Power Steering
PSCM—Power Steering Control Module
psi—Pounds per Square Inch
Pt—Pint
PWM—Pulse Width Modulated
Qt—Quart
RAM—Random Access Memory
REF—Reference
RF—Right Front
RFI—Radio Frequency Interference
RH—Right Hand
ROM—Read Only Memory
RPM—Engine Speed
RPO—Regular Production Option
RR—Right Rear
RS—Right Side
RTV—Room Temperature Vulcanizing
RVR—Response Vacuum Reducer
RWAL—Rear Wheel Antilock Brakes
SAE—Society of Automotive Engineers
Sec—Secondary
SFI—Sequential Multiport Fuel Injection
SI—System International
Sol—Solenoid
SPEC—Specification
Speedo—Speedometer
SRI—Service Reminder Indicator
SRT—System Readiness Test
ST—Scan Tool
SYN—Synchronize
TAC—Thermostatic Air Cleaner
Tach—Tachometer
Term—Terminal
TEMP—Temperature
TRANS—Transmission
TVRS—Television & Radio Suppression
V—Volt(s)
VAC—Vacuum
VAF—Volume Air Flow
VCM—Vehicle Control Module
VDOT—Variable Displacement Orifice Tube
VIN—Vehicle Identification Number
VR—Voltage Regulator
V-ref—ECM Reference Group
VRV—Vacuum Reducer Valve
VSS—Vehicle Speed Sensor
w/—With
w/b—Wheel Base
w/o—Without

REPLACEMENT LABELS

Replacement labels are available through GM Service Parts Operations (SPO) for the following:

- Spare Wheel Caution
- Cooling Fan Caution

These and other labels will be found in the Standard Parts Catalog.

The Vehicle Certification Label, Tire Pressure Placard and Service Parts Identification Label are **NOT** available as service parts.

OPTION AND PROCESS CODES

A52 Seat: Front Bench
BG9 Covering: Floor, upper
C60 HVAC Sys: Front Manual Controls
C6F GVW Rating: 5150 lb.
D44 Mirror: Outside, Painted
E63 Body Equipment: Fleetside Pubx
FF4 Arm: Torsion Bar Spring Adj. (C)
FK3 Arm: Torsion Bar Spring Adj. (C)
G97 Axle, Rear: No ratio
JM3 Brake Booster, 240 mm, Tandem, High Flow
K34 Cruise Control, Electronic
E63 Pickup Box: Fleetside
LN1 Engine: Electric Motor, 102 kw, AC 312V
NC9 Emission System California, ZEV
N33 Steering Column, Tilt Type
N40 Steering, Power Non-Variable Ration
PH1 Wheel: 15 X 7 Steel
QEG Tire: All 205/75R15-97S BW R/PE ST TL ALS
SLA Plant Code: Shreveport, LA
T61 Lighting: Daytime Running
UM7 Radio: AM/FM ST, Seek/Scan, ETR
UP8 Radio: Provisions for Stereo
U73 Radio Antenna: Fixed
VF6 Bumper: Rear Step
VG8 Vehicle Buyer Notice Label
VS7 Vehicle: Non-Salable
VXS Vehicle: Complete
V73 Vehicle Statement: US & Canada
XEG Tire: Front P205/75R15-97S BW R/PE ST TL ALS
X88 Conversion Name Plate: Chevrolet
YA7 Test Emission: California Assembly Line
YD3 Axle: Base Equipment
YD5 Spring: Front Base Equipment
YD6 Spring: Rear Base Equipment
YEG Tire: Rear P205/75R15-97S BW R/PE ST TL ALS
YF5 Certification Emission, California
ZQ3 Sales Pkg., Driver Convenience
ZY1 Color Combination, Solid
Z85 Chassis Package, Increased Capacity
13D Trim Combination, Cloth, Lt. Gray
13I Interior Trim: Lt. Smoke Gray (91)
50U Primary Color, Exterior, Olympic White
6WJ Component: Front LH Computer Sel Susp
7WJ Component: Front RH Computer Sel Susp
8Z2 Transmission Delete
9L3 Tire: Spare Delete

BLANK

SECTION 0B

MAINTENANCE AND LUBRICATION

SCHEDULED MAINTENANCE SERVICES

INTRODUCTION

This section covers the maintenance required to maintain safety, dependability, and vehicle performance.

Important

Keep the drive motor oil at the proper level.

HOW THIS SECTION IS ORGANIZED

The remainder of this section is divided into four parts:

"Part A: Scheduled Maintenance Services" shows what services to perform and how often. Some of these services can be complex, and require a trained technician to perform.

CAUTION: Performing maintenance work on a vehicle can be dangerous. Attempting repairs or service without the appropriate training, tools, and equipment could cause injury to you or others and damage to the vehicle.

You will find a list of GM publications and how to get them in this manual. Refer to Service Publications in the Index.

"Part B: Owner Checks and Services" tells what should be checked when batteries are charged. It also explains what can be done easily to help keep these vehicles in good condition.

"Part C: Periodic Maintenance Inspections" explains important inspections that a trained technician should perform.

"Part D: Recommended Fluids and Lubricants" lists some products GM recommends to help keep these vehicles properly maintained. Use these products, or their equivalents, whenever performing maintenance services.

PART A: SCHEDULED MAINTENANCE SERVICES

USING THE MAINTENANCE SCHEDULE

GM wants to help keep these vehicles in good working condition. Because of all the different ways people use their GM vehicles, maintenance needs vary. Therefore, frequent checks and replacement than you'll find in the schedules in this section may be needed. Read this section, and keep in mind the customer's driving habits.

The proper fluids and lubricants are listed in Part D. Use the proper fluids and lubricants whenever servicing these vehicles.

The schedules are for vehicles that:

- Carry passengers and cargo within recommended limits. Refer to Vehicle Certification Label in this section.
- Are driven on reasonable road surfaces within legal driving limits.

MAINTENANCE SCHEDULE

The services shown in this schedule up to 100,000 miles (166,000 km) should be performed after 100,000 miles (160,935 km) at the same intervals. The services shown in this schedule up to 150,000 miles (241,402 km) should be performed at the same interval after 150,000 miles (241,402 km) at the same intervals.

FOOTNOTES

The California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of vehicle useful life. GM, however, urges that all recommended maintenance be recorded.

3,000 Miles (4,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.

6,000 Miles (9,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.

- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

9,000 Miles (14,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

12,000 Miles (19,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.

15,000 Miles (24,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

18,000 Miles (28,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

21,000 Miles (33,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

24,000 Miles (38,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.

27,000 Miles (43,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

30,000 Miles (48,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

33,000 Miles (52,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

36,000 Miles (57,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.

39,000 Miles (62,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

42,000 Miles (67,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

45,000 Miles (72,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

48,000 Miles (76,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.
- Inspect fuel-fired heater fuel tank, fuel cap, and fuel lines for damage or leaks. Inspect fuel cap gasket for damage. Replace as required.

51,000 Miles (81,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

54,000 Miles (86,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

57,000 Miles (91,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

60,000 Miles (96,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling, or chaffing. Replace as required.

63,000 Miles (100,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

66,000 Miles (105,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

69,000 Miles (110,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

72,000 Miles (115,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.

- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.

75,000 Miles (120,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

78,000 Miles (124,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

81,000 Miles (129,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

84,000 Miles (134,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.

87,000 Miles (139,200 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

90,000 Miles (144,000 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.

93,000 Miles (148,800 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

96,000 Miles (153,600 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.
- Rotate tires. Refer to Tires and Wheels.
- Inspect high-voltage cables for cracks, breaks, or chaffing. Replace as required.
- Inspect the thermal coolant system hoses for leaks, cracks, hardening, swelling , or chaffing. Replace as required.
- Inspect fuel-fired heater fuel tank, fuel cap, and fuel lines for damage or leaks. Inspect fuel cap gasket for damage. Replace as required.

99,000 Miles (158,400 km)

- Inspect axle shaft bootseals, suspension bushings and ball joint seals for cracks, tears, or leakage. Service as necessary.
- Lubricate the front suspension, ball joints, steering linkage, parking brake cable guides, and brake pedal springs every 3 months.
- Check drive motor fluid level and add fluid as needed.

100,000 Miles (160,000 km)

- Drain, flush, and refill the cooling system with new coolant (or every 120 months, whichever occurs first). Refer of Propulsion System Cooling.

PART B: OWNER CHECKS AND SERVICES

Listed below are checks and services that should be performed at the intervals specified to help ensure the safety, dependability and performance of the vehicle.

Make sure any necessary repairs are completed on time. Whenever any fluids or lubricants are added to the vehicle, make sure they are the proper ones, as shown in Part D.

At Each Battery Charge

It is important to perform these underhood checks at each recharge interval.

Propulsion System Coolant Level

Check the coolant level and add the proper coolant mixture, if necessary. Refer to Propulsion System Cooling.

Windshield Washer Fluid Level

Check the windshield washer fluid level in the windshield washer tank and add the proper fluid, if necessary. Refer to Windshield Wiper/Washer System.

At Least Once a Month

Tire Inflation

Check tire inflation. Make sure tires are inflated to the pressures specified on the Certification/Tire label located on the driver's door lock pillar. Refer to Tires and Wheels..

Fuel-Fired Heater Coolant Level

Check the coolant level.

At Least Once a Year

Key Lock Cylinders

Lubricate the key lock cylinders with the lubricant specified in Part D.

Body Lubrication

Lubricate all body door hinges, the body hood, fuel door and rear compartment hinges, latches and locks including interior glove box and console doors, and any moving seat hardware. Lubricate the hood safety lever pivot and prop rod pivot. Part D explains what lubricant to use. More frequent lubrication may be required when exposed to a corrosive environment.

Starter Switch

CAUTION: When performing this check, the vehicle could move suddenly. If it does, you or others could be injured. Follow the steps below.

1. Before you start, make sure you have enough room around the vehicle.
2. Firmly apply both the parking brake and the regular brake.

NOTE: Do not use the accelerator pedal, and be ready to turn off the motor immediately if it starts.

Steering Column Lock

While parked, and with the parking brake set, try to turn the key to LOCK in each shift lever position.

- The key should turn to lock only when the shift lever is in PARK.

On all vehicles, the key should come out only in LOCK.

Parking Brake and Automatic Transmission PARK Mechanism Check

CAUTION: When performing this check, the vehicle could begin to move. You or others could be injured and property could be damaged. Make sure there is room in front of your vehicle in case it begins to roll. Be ready to apply the regular brake at once should the vehicle begin to move.

Park on a fairly steep hill, with the vehicle facing downhill. Keeping your foot on the regular brake, set the parking brake.

- To check the parking brake: With the key in the run position and the shifter in NEUTRAL, slowly remove foot pressure from the regular brake pedal. Do this until the vehicle is held by the parking brake only.
- To check the PARK mechanism's holding ability, shift to PARK, then, release all brakes.

Lap and Shoulder Belts Condition and Operation

Inspect belt system, including: webbing, buckles, latch plates, retractors, guide loops, and anchors. Replace the belt if the webbing has been cut or otherwise damaged.

PART C: PERIODIC MAINTENANCE INSPECTIONS

Listed below are inspections and services that should be performed at least twice a year for instance, each spring and fall. Make sure any necessary repairs are completed at once.

Steering and Suspension Inspection

Inspect the front and rear suspension and steering system for damaged, loose or missing parts, signs of wear, or lack of lubrication. Inspect power steering lines and hoses for proper hookup, binding, leaks, cracks, chafing, etc. Lubricate the steering linkage.

Exhaust System Inspection

Inspect the fuel-fired heater exhaust system. Inspect the body near the exhaust system. Look for broken, damaged, missing or out-of-position parts as well as open seams, holes, loose connections, or other conditions that could cause a heat build-up. Refer to Heater, Ventilation, and Air Conditioning.

Drive Motor

Check drive motor fluid level and add as needed.

Drive Motor Inspection

Every 12 months check half shaft and drive motor and add lubricant when necessary.

PART D: RECOMMENDED FLUIDS AND LUBRICANTS

NOTE: Fluids and lubricants identified below by name, part number, or specification may be obtained from your GM dealer.

MAINTENANCE RECORD

Important

After the scheduled services are performed, record the date, odometer reading and who performed the service in the Owner's Manual after the maintenance interval.

RECOMMENDED FLUIDS AND LUBRICANTS

USAGE	FLUID/LUBRICANT
Drive Motor Oil	Mobil Infilrex® EV synthetic oil GM P/N 12371288 or equivalent conforming to Delphi-E specification M5977.
Propulsion System Coolant	Texaco Havoline® ELECTRA-COOL ™ (i.e. GM P/N 27002485).
Hydraulic Brake System	Delco Supreme 11® Brake Fluid or equivalent DOT-3 brake fluid.
Parking Brake Guides	Chassis lubricant (GM P/N 1052497 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Power Steering System	GM H Electrohydraulic Power Steering Fluid (GM P/N 27002509 or equivalent).
Key Lock Cylinders	Lubricate with Multi-Purpose Lubricant (GM P/N 12346241) or synthetic SAE 5W-30 engine oil.
Chassis Lubrication	Chassis lubricant (GM P/N 1052497 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Column Shift	Chassis lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB (GM P/N 1052497).
Windshield Washer Solvent	GM Optikleen® Washer Solvent (GM P/N 1051515) or equivalent.
Hood Latch Assembly A. Pivots and Spring B. Release Pawl	A. SAE 30W oil. B. Chassis lubricant (GM P/N 12346293 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Outer Endgate Handle Pivot Points, and Hinges	Multi-purpose lubricant Superlube® (GM Part No. 12346241 or equivalent).
Weatherstrip Conditioning	Dielectric Silicone Grease (GM P/N 12345579 or equivalent).
Fuel-Fired Heater System Coolant	—

MAINTENANCE ITEMS

Item	Application	Part Number
Radiator Cap	S-10 Electric Truck	AC Type RC-36

APPROXIMATE FLUID CAPACITIES

Item	Liters	Quarts
Propulsion System Cooling System	3.36	3.56
Drive Motor	1.65	1.75
Power Steering Fluid Reservoir	0.70	0.74
Fuel-Fired Heater Coolant	6.50	6.80
Fuel-Fired Heater Fuel Tank	5.77	1.50*
* = Gallons		

BLANK

SECTION 0C

VIBRATION DIAGNOSIS

GENERAL DESCRIPTION

VIBRATION THEORY

The vehicle designs and the engineering requirements have undergone drastic changes in this decade. The following factors drive many of these requirements:

- Increased fuel costs
- Decreased fuel supplies
- Corporate Average Fuel Economy (CAFE)
- Clean air legislation
- Foreign competition
- Crashworthiness
- Rising customer expectations

The vehicle designs have evolved from the full frame construction, where multiple isolating body mounts were used, to the lighter unibody designs of today. The unibody designs transfer any noise or vibration faster.

The use of heavier V8 engines has been reduced, being replaced with lighter, more fuel-efficient four and six-cylinder engines. During this same period, options such as air conditioning and power steering have become more popular. These types of options increase the engine load, resulting in unwanted noise and vibration.

The presence/absence of unwanted noise and vibration is linked to the customer's perception of the overall vehicle quality.

Vibration is the repetitive motion of an object, back and forth, or up and down. The following conditions cause most vehicle vibrations:

- A rotating component
- The engine combustion process of firing impulses

Rotating components will vibrate with excessive imbalance or runout. During vibration diagnosis, the amount of allowable imbalance or runout should be considered a TOLERANCE and not a SPECIFICATION. In other words, the less imbalance or runout the better.

A vibrating component operates at a consistent rate (km/h, mph, or rpm). Measure the rate of vibration in question. When the rate/speed is determined, relate the vibration to a component that operates at an equal rate/speed in order to pinpoint the source. Vibrations also tend to transmit through the body structure to other components. Therefore, just because the seat vibrates doesn't mean the source of vibration is the seat.

Vibrations consist of the following three elements:

- The source—the cause of the vibration
- The transfer path—the path the vibration travels through the vehicle
- The responder—the component where the vibration is felt

In Figure 1, the source is the unbalanced tire. The transfer path is the route the vibrations travel through the vehicle's suspension system into the steering column. The responder is the steering wheel, which the customer reports as vibrating. Eliminating any one of these three elements will usually correct the condition. Decide, from the gathered information, which element makes the most sense to repair. Adding a brace to the steering column may keep the steering wheel from vibrating, but adding a brace is not a practical solution. The most direct and effective repair would be to properly balance the tire.

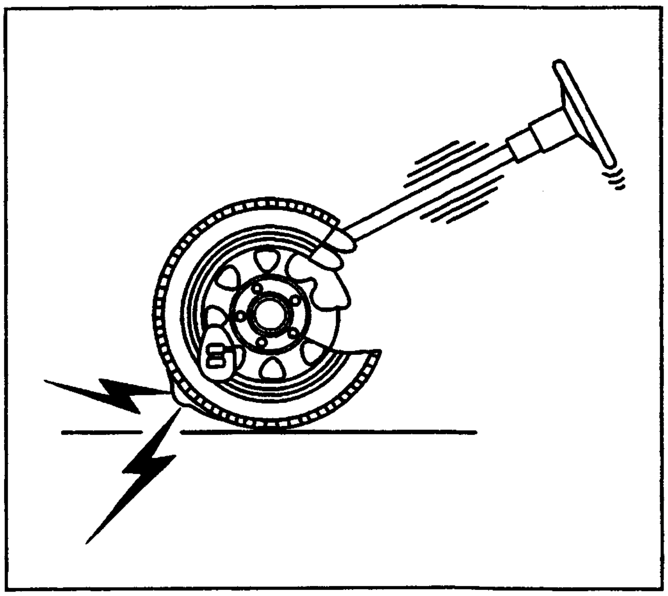


Figure 1—Vibration Source, Transfer Path, and Responder

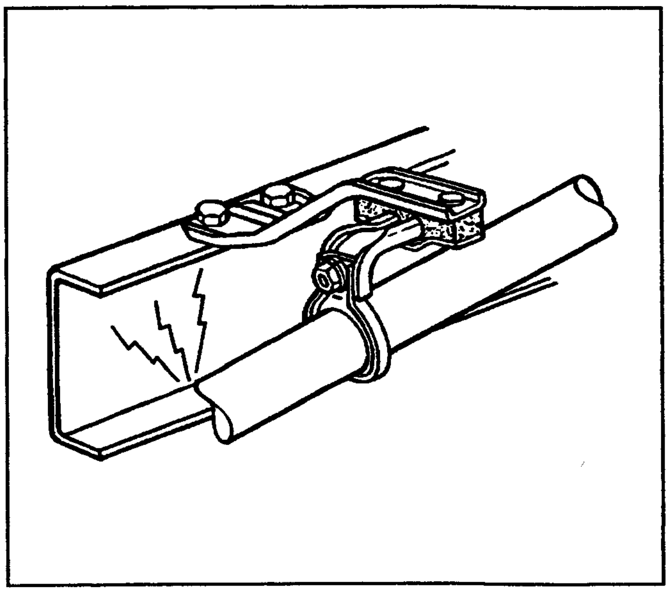


Figure 2—Grounded Part to Frame

Vibration can also produce noise. As an example, consider a vehicle that has an exhaust pipe GROUNDED to the frame. The source of the vibration is the engine firing impulses traveling through the exhaust. The transfer path is a grounded or bound-up exhaust hanger. The responder is the frame. The floor panel vibrates, acting as a large speaker, which produces noise. The best repair would be to eliminate the transfer path. Aligning the exhaust system and correcting the grounded condition at the frame would eliminate the transfer path.

BASIC VIBRATION TERMINOLOGY

The following are the two primary components of vibration diagnosis:

- The physical properties of objects
- The object's properties of conducting mechanical energy

The repetitive up and down or back and forth movement of a component cause most customer vibration complaints. The following are the common components that vibrate:

- The steering wheel
- The seat cushion
- The frame
- The instrument panel

Vibration diagnosis involves the following simple stepwise outline:

1. Measure the repetitive motion and assign a value to the measurement in cycles per second (cps) or cycles per minute (cpm).
2. Relate the frequency back on terms of the rotational speed of a component that is operating at the same rate or speed.
3. Inspect and test the components for conditions that cause vibration.

For example, performing the following steps will help demonstrate the vibration theory:

1. Clamp a yardstick to the edge of a table, leaving about 50 cm (20 in) hanging over the edge of the table.
2. Pull down on the edge of the stick and release while observing the movement of the stick (Figure 3).

The motion of the stick occurs in repetitive cycles. The cycle begins at midpoint, continues through the lowest extreme of travel, then back past the midpoint, through the upper extreme of travel, and back to the midpoint where the cycle begins again.

The cycle occurs over and over again at the same rate, or frequency. In this case, about 10 cycles in one minute. If we measure the frequency to reflect the number of complete cycles that the yardstick made in one minute, the measurement would be 10 cycles x 60 seconds = 600 cpm.

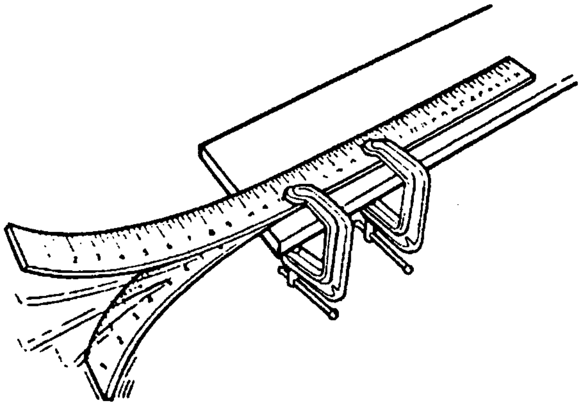


Figure 3—Vibration Demonstration

We have also found a specific amount of motion, or amplitude, in the total travel of the yardstick from the very top to the very bottom. Redo the experiment as follows:

1. Reclamp the yardstick to the edge of a table, leaving about 25 cm (10 in) hanging over the edge of the table.
2. Pull down on the edge of the stick and release while observing the movement of the stick.

The stick vibrates at a much faster frequency: 30 cycles per second (1,800 cycles per minute).

Cycles

The word CYCLE comes from the same root as the word CIRCLE. A circle begins and ends at the same point, as thus, so does a cycle. All vibrations consist of repetitive cycles.

Frequency

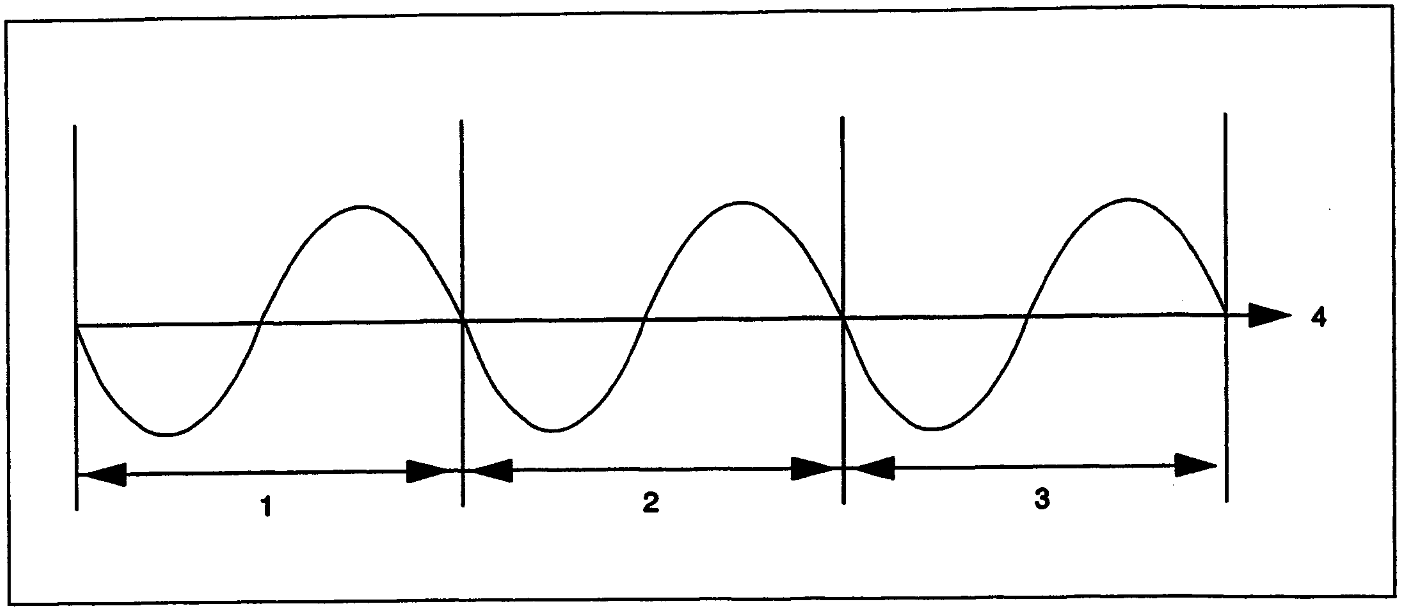
Frequency is defined as the rate at which an event occurs during a given period of time. With a vibration, the event is a cycle, and the period of time is one second. Thus, frequency is expressed in cycles per second (cps).

The proper term for cycles per seconds is Hertz (Hz). This is the most common way to measure frequency. Multiply the Hertz by 60 to get the cycles or revolutions per minute (rpm).

Amplitude

Amplitude is the maximum value of a periodically varying quantity. Used in vibration diagnostics, we are referring it to the magnitude of the disturbance. A severe disturbance would have a high amplitude; a minor disturbance would have a low amplitude.

Amplitude is measured by the amount of actual movement, or displacement. For example, consider the vibration caused by an out-of-balance wheel at 80 km/h (50 mph) as opposed to 40 km/h (25 mph). As the speed increases, the amplitude increases.



Legend

(1) 1st Cycle
(2) 2nd Cycle
(3) 3rd Cycle
(4) Time

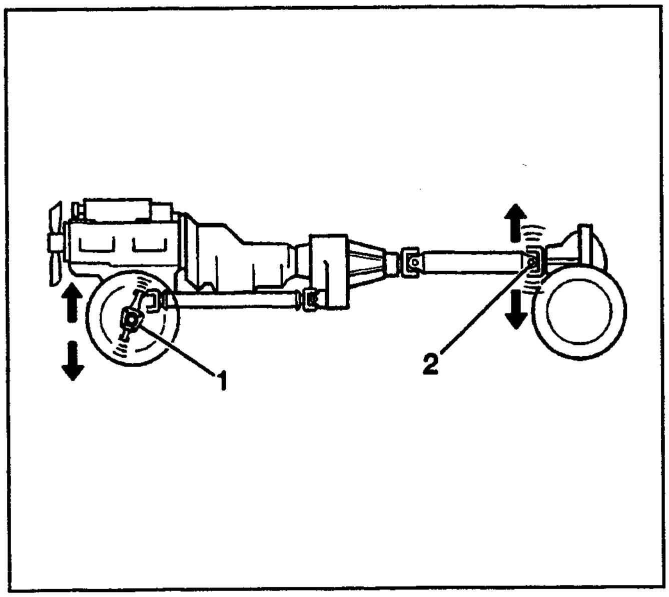
Figure 4 - Cycles

Free Vibration

Free vibration is the continued vibration in the absence of any outside force. In the yardstick example, the yardstick continued to vibrate even after the end was released.

Forced Vibration

Forced vibration is when an object is vibrating continuously as a result of an outside force.



Legend

(1) Spindle
(2) Pinion Noise

Figure 5 - Vibration Cycles In Powertrain Components

Centrifugal Force

A spinning object with an imbalance generates a centrifugal force. Performing the following steps will help to demonstrate centrifugal force:

1. Tie a nut to a string.
2. Hold the string. The nut hangs vertically due to gravity.
3. Spin the string. The nut will spin in a circle.

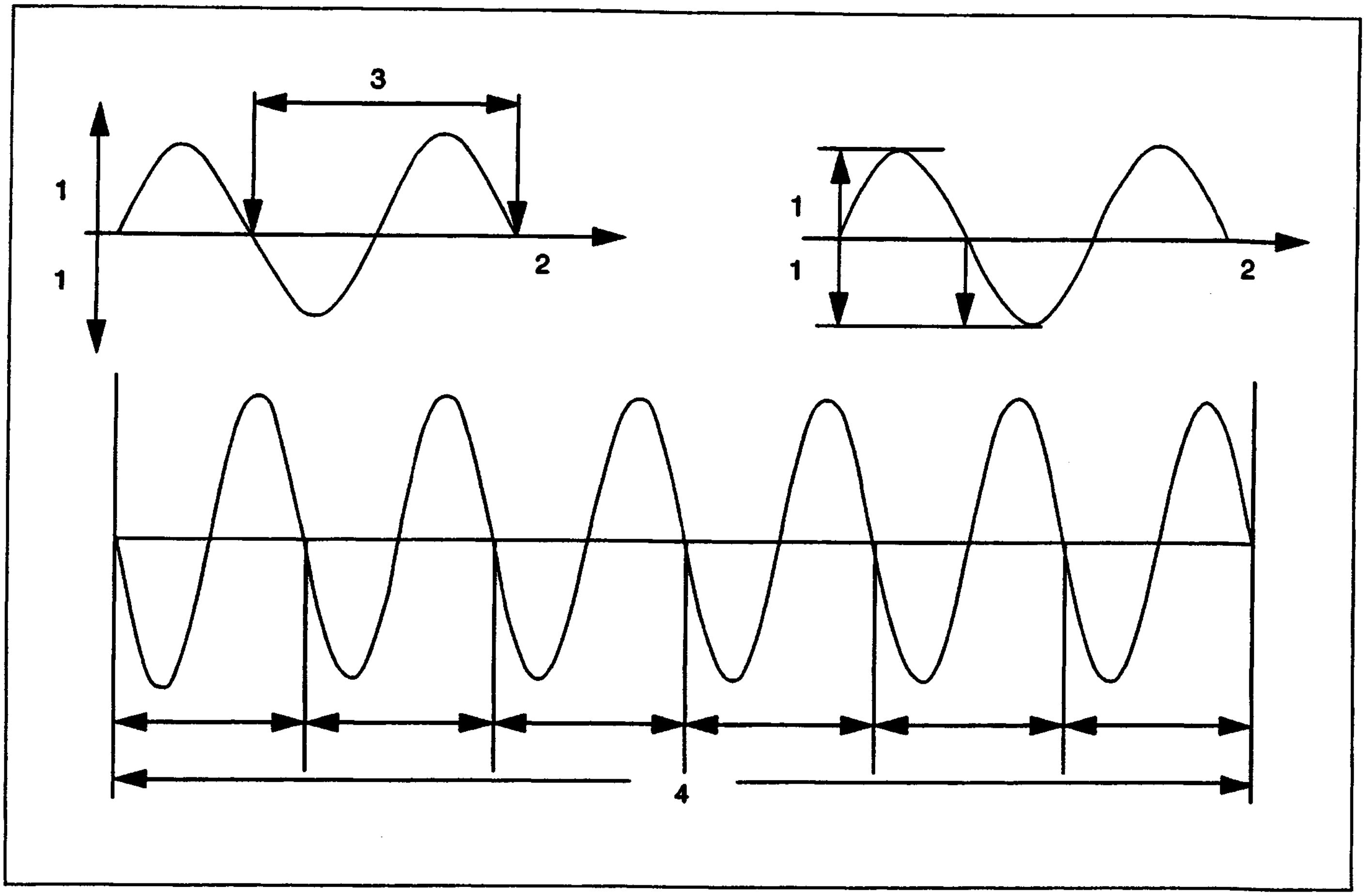
Centrifugal force is trying to make the nut fly outward, causing the pull you feel on your hand. An unbalanced tire follows the same example. The nut represents the imbalance in the tire. The string represents the tire, wheel and suspension assembly. As the vehicle speed increases, the disturbing force of the unbalanced tire can be felt in the steering wheel, the seat, and the floor. This disturbance will be repetitive (Hz) and the amplitude will increase. At higher speeds, both the frequency and the amplitude will increase. As the tire revolves, the imbalance, or the centrifugal force, will alternately lift the tire up and force the tire downward, along with the spindle, once for each revolution of the tire.

Natural or Resonant Frequency

The natural frequency is the frequency at which an object tends to vibrate. Bells, guitar strings, and tuning forks are all examples of objects that tend to vibrate at specific frequencies when excited by an external force (Figure 9).

Suspension systems, and even engines within their mounts, have a tendency to vibrate at certain frequencies. This is why some vibration complaints occur only at specific vehicle speeds or engine rpm.

The stiffness and the natural frequency of a material have a relationship. Generally, the stiffer the material, the higher the natural frequency. The opposite is also true. The softer a material, the lower its natural frequency. Conversely, the greater the mass, the higher the natural frequency.



Legend

- (1) Amplitude
- (2) Reference
- (3) Time in Seconds
- (4) 1 Second

Figure 6 - Frequency

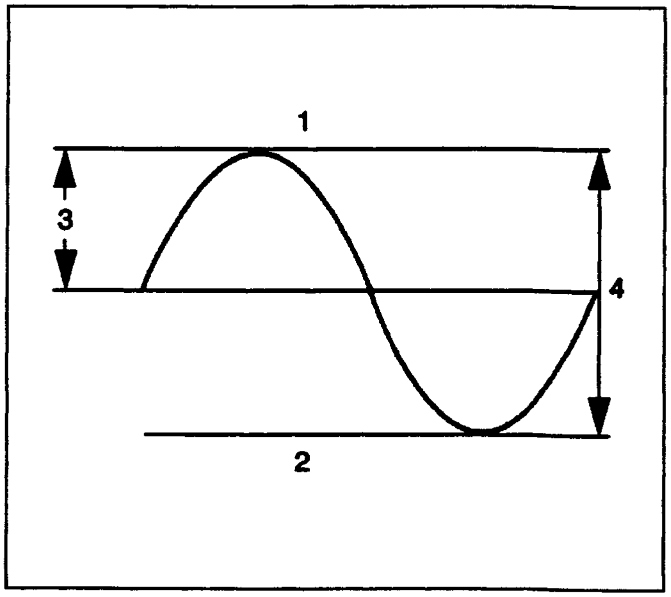
Resonance

All objects have natural frequencies. The natural frequency of an typical automotive front suspension is in the 10-15 Hz range. This natural frequency is the result of the suspension design. The suspension's natural frequency is the same at all vehicle speeds. As the tire speed increases along with the vehicle speed, the disturbance created by the tire increases in frequency. Eventually, the frequency of the unbalanced tire will intersect with the natural frequency of the suspension. This causes the suspension to vibrate. The intersecting point is called the resonance (Figure 10).

The amplitude of a vibration will be greatest at the point of resonance. While the vibration may be felt above and below the problem speed, the vibration may be felt the most at the point of resonance.

Damping

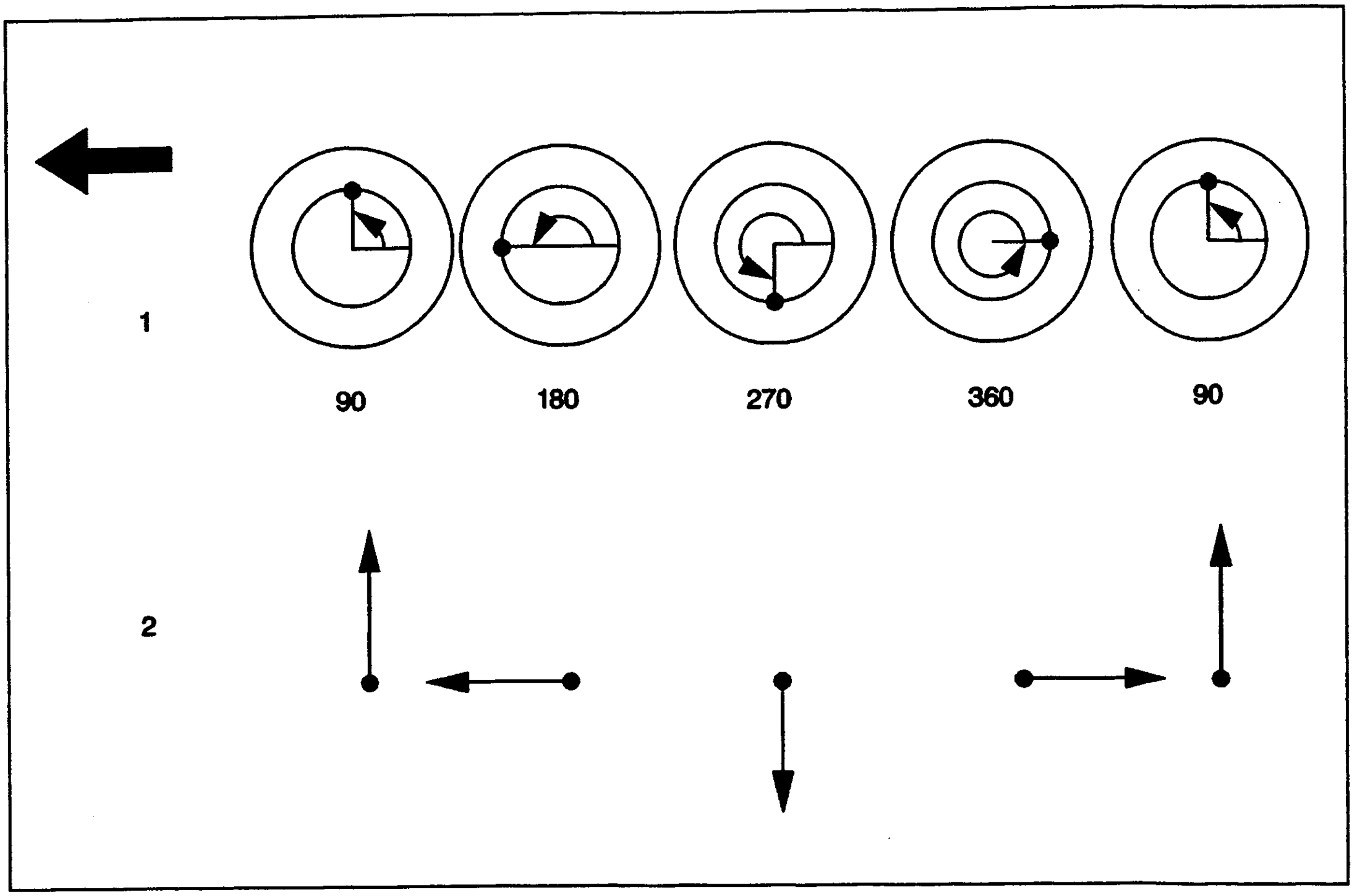
Damping is the ability of an object or material to dissipate or absorb vibration. The automotive shock absorber is a good example. The function of the shock absorber is to absorb or dampen the oscillations of the suspension system.



Legend

- (1) Maximum
- (2) Minimum
- (3) Zero-to-peak Amplitude
- (4) Peak-to-peak Amplitude

Figure 7 - Amplitude



Legend
(1) Location of Imbalance (Degrees)
(2) Centrifugal Force Acting on Spindle

Figure 8 - Amplitude

Beating

Two separate disturbances that are relatively close together in frequency will lead to a condition called beating, or phasing. A beating vibration condition will increase in intensity or amplitude in a repetitive fashion as the vehicle travels at a steady speed. This beating vibration can produce the familiar droning noise heard in some vehicles.

Beating occurs when two vibrating forces are adding to each other's amplitude. However, two vibrating forces can also subtract from each other's amplitude. The adding and subtracting of amplitudes in similar frequencies is called beating. In many cases, eliminating either one of the disturbances can correct the condition.

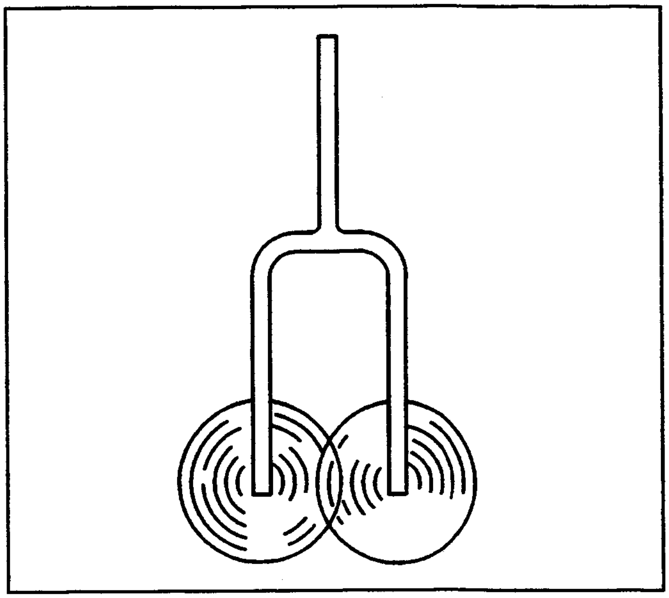
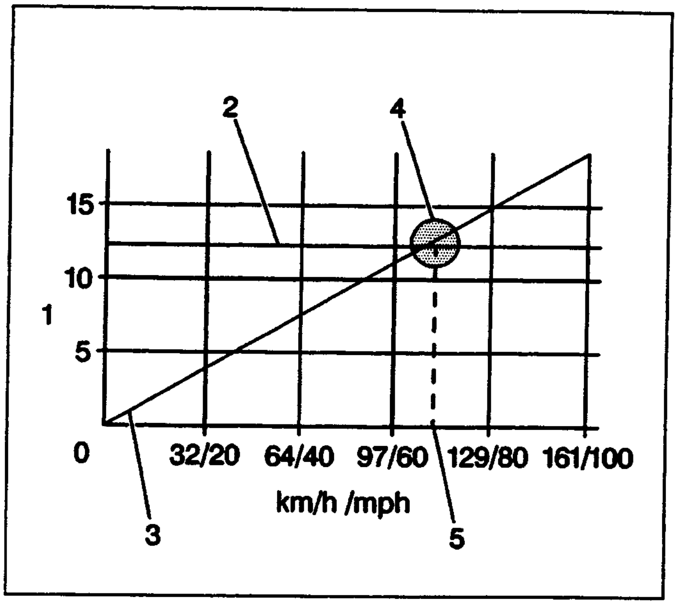


Figure 9—Resonant Frequency



Legend

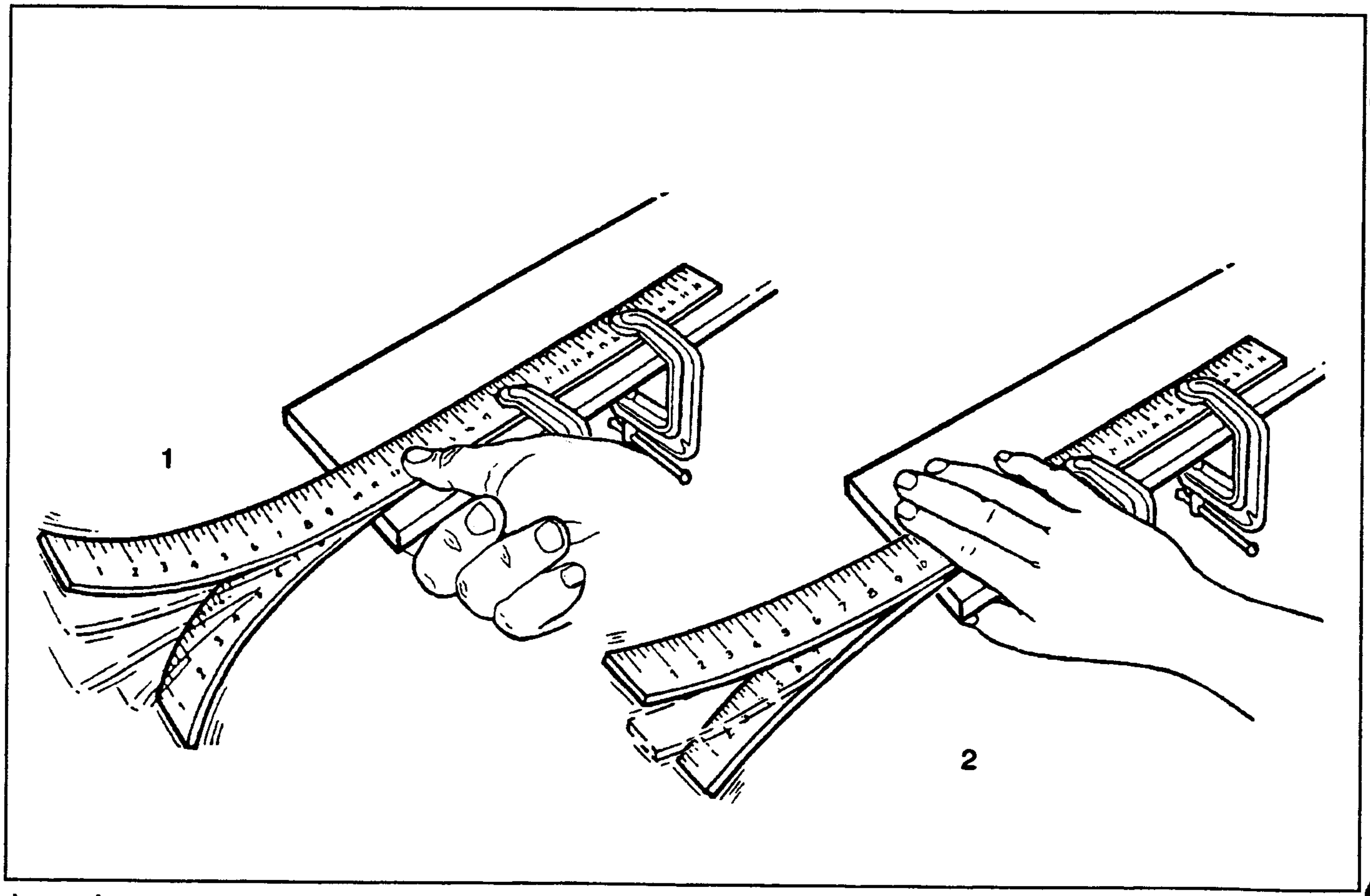
(1) Frequency—cps
(2) Suspension Frequency
(3) Unbalanced Excitation
(4) Point of Resonance
(5) Problem Speed

Figure 10 - Resonance

Order

Order refers to how many times an event occurs during one revolution of a rotating component. For example, a tire with one high spot would create a disturbance once for every revolution of the tire. This is called first order vibration (Figure 13).

An oval-shape tire with two high spots would create a disturbance twice for every revolution. This is called second order vibration. Three high spots would be a third order vibration, and so forth. Two first order vibrations may add or subtract from the overall amplitude of the disturbance, but that is all. Two first order vibrations do not equal a second order. Due to centrifugal force, an unbalanced component will always create at least a first order vibration.



Legend

(1) Low Damping
(2) High Damping

Figure 11 - Damping

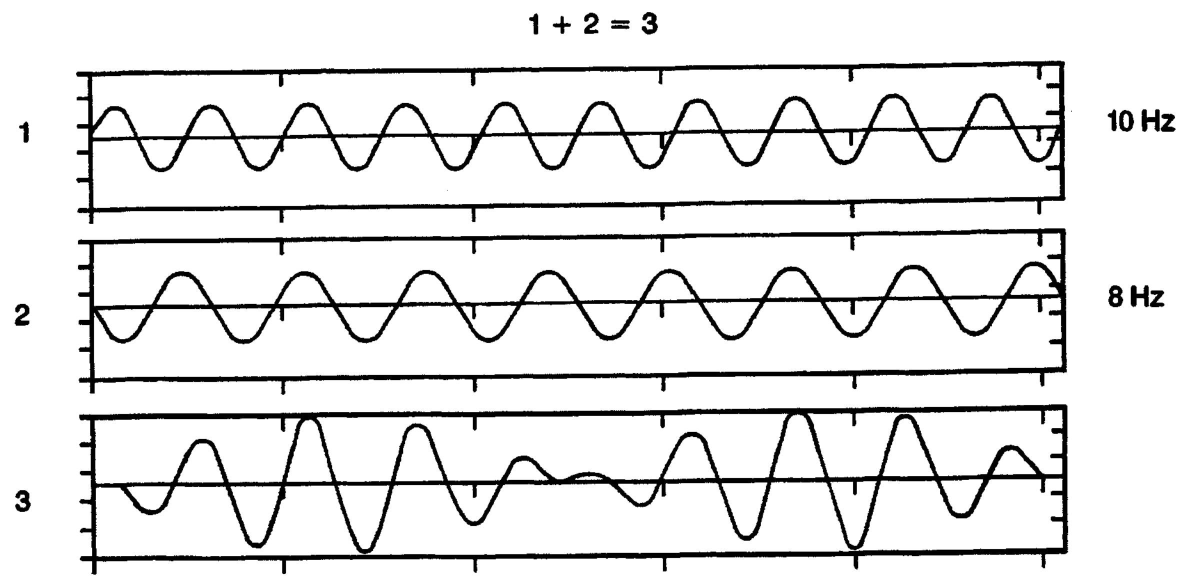


Figure 12—Beating

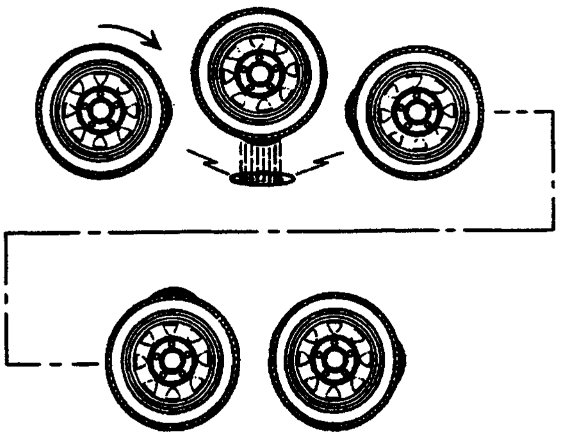


Figure 13—First Order Vibration

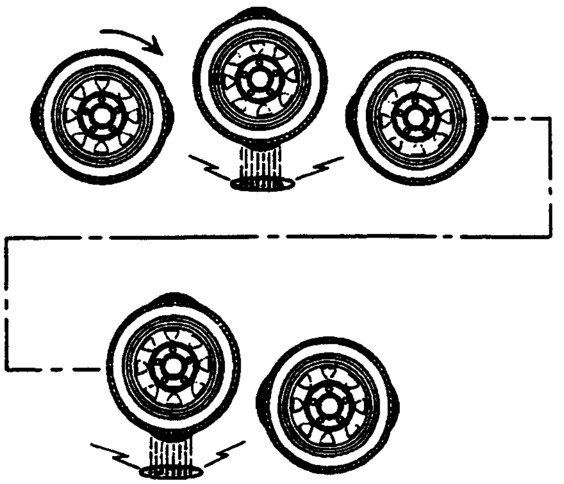


Figure 14—Second Order Vibration

SPECIAL TOOL DESCRIPTION

Special tools can be used to identify the frequency of a rotational component with a repetitive vibration. These tools are a Reed Tachometer or an Electronic Vibration Analyzer (EVA).

REED TACHOMETER

The Biddle Frahm Reed Tachometer P/N 313510 (or an equivalent tool) measures vibration in cycles per second (cps) (Figure 15). The tool uses two rows of reeds. Each row vibrates at a particular frequency. Matching the rotational speed of a particular component with the frequency reading of the Reed Tachometer can indicate the area that requires repair attention.

Frequency relationships exist for all vibrations in a vehicle. An understanding of frequency relationships can facilitate the resolution of difficult vibration problems.

Using the Reed Tachometer

The best place in the vehicle to put the Reed Tachometer is on top of the instrument panel. This location allows the tachometer to pick up vibration. This location also affords an easy view of the tachometer. If the tachometer cannot read the vibration from the top of the instrument panel, place it in another location that is responding to the source of the vibration.

Reduce the effects of road surface during testing by driving on a smooth road (preferably asphalt).

The reeds of the Reed Tachometer are very sensitive. They will pick up many low amplitude sounds, (Figure 16) which appear as slight movement of many of the reeds. Do not be concerned with such movement. These movements do not correspond to a particular component. Vibrating components register a greater amplitude. Reed movement that corresponds to a vibrating component will travel the full range of the viewing area.

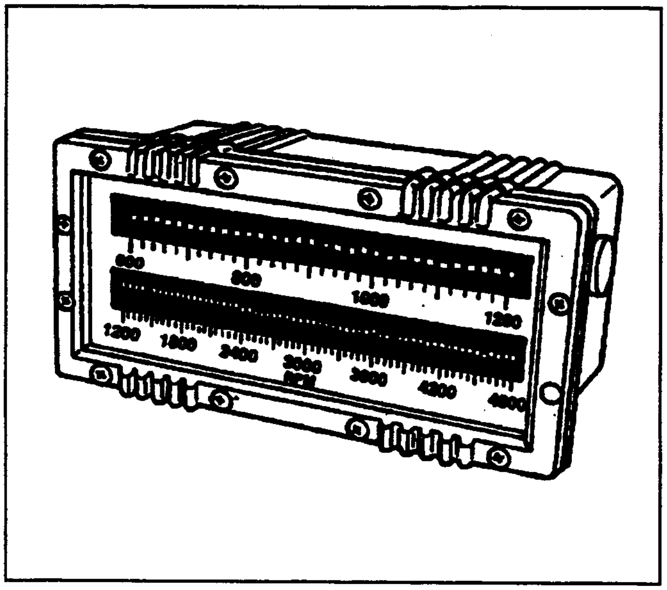


Figure 15—Reed Tachometer

Example 1: Determining a First Order Disturbance

- The Road Test:
- The road test reveals a low frequency (shake) vibration at 2,400 rpm with the transmission in direct drive.
- The Given Information:
- The Reed Tachometer reads at 800 cps.
- The Calculations:
  - — First order of tire and rear end: 2,400 rpm with a 3.0 to 1 rear axle ratio = 800 rpm.
  - — The first order of the prop shaft = 2,400.
- The Conclusion:
  - — The vibration frequency (800) relates to the first order rotation of the tire and wheel assembly.
  - — Correct the tire/wheel assembly for a first order disturbance.

Example 2: Determining a Second Order Disturbance

- The Road Test:
- The road test reveals a high frequency vibration at 2,400 rpm with the transmission in direct drive.
- The Given Information:
  - — The Reed Tachometer reads at 1,600 cps.
  - — Vibration is vehicle speed dependent.
  - — The rear axle ratio is 3.0 to 1.
- The Calculations:
  - — First order of tire and rear end: 2,400 rpm with a 3.0 to 1 rear axle ratio = 800 rpm.
  - — The first order of tire and wheel = 800.
  - — Second order of the tire and the wheel: 800 x 2 = 1,600.
- The Conclusion:
  - — The vibration frequency (1,600) relates to the second order rotation of the tire and the wheel.
  - — Correct the tire/wheel assembly for a second order disturbance.

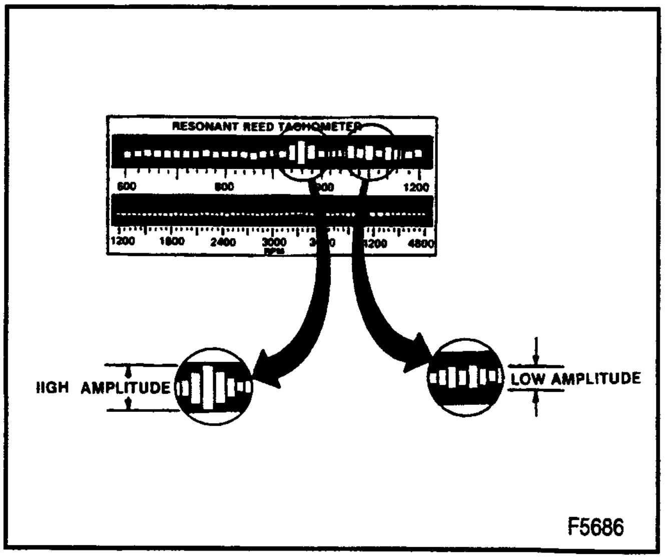


Figure 16—Amplitude

Light Duty Truck Tire Speed Table

Tire Size	Tread	Revs/Sec at 5 mph
P195/75R15	ALS	1.09
P205/75R15	ALS	1.06
P235/75R15	ALS	1.00
P275/60HR15	AL3	1.03
31X10.5R15/B	OOR	0.95
P245/75R16	AT	0.94
P265/75R16	AT	0.91
LT195/75R14/C	ALS	1.13
LT225/75R16/C	ALS	0.99
LT225/75R16/D	ALS	0.99
LT225/75R16/E	ALS	0.99
LT245/75R16/C	ALS	0.95
LT215/85R16/D	HWY	0.95
LT235/85R16/E	HWY	0.99
TREAD TYPES: .list0 ALS = ALL-SEASON AT = ALL TERRAIN HWY = HIGHWAY OOR = ON-OFF ROAD		

ELECTRONIC VIBRATION ANALYZER (EVA)

The Electronic Vibration Analyzer (EVA), J 38792, is specifically designed to diagnose vibrations. This hand-held device is similar to a scan tool (Figure 17). A standard 12-volt power feed supplies the power. The vibration sensor, or the accelerometer, is at the end of a 6 m (20 ft) cord. The vibration sensor can be mounted virtually anywhere on the vehicle where a vibration is felt.

EVA Basic Hookup

1. Inspect that the software cartridge is correctly inserted at the bottom of the unit. (The cartridge usually remains there at all times.)
2. Connect the vibration sensor cord into either input A or B.
3. Line up the connector so that the release button is at the bottom.
4. Push the connector into the input until the connector clicks and locks in place.
5. Plug the power cord into a 12-volt power feed in order to turn the EVA on. (There is no ON-OFF switch.)

To disconnect the sensor, press the release button and gently pull the connector straight out.

EVA Sensor Placement

Proper EVA sensor placement is critical in order to take proper vibration readings. The sensor can be placed anywhere on the vehicle where vibrations are felt. Use putty or a hook and loop fastener in order to hold the sensor in place on non-ferrous surfaces, such as the surface of the steering column (Figure 18). A magnet is supplied in order to hold the sensor to ferrous surfaces (Figure 19).

Vibrations are typically felt in an up and down direction. The sensor is directionally sensitive. Therefore, place sensor as flat as possible up the side marked UP facing upward. Place the UP side of the sensor in the exact position every time for consistent results when repeating the tests or making a comparison.

EVA Display

The EVA offers the following main display features, all of which are described below:

- Freeze
- Record/Playback
- Averaging/Non-averaging modes
- Strobe Balancing

Freeze

Pressing the FREEZE button on the keypad activates the freeze function, which locks the display of data. The display shows FRZ at the top. The freeze function is useful when conducting an acceleration/deceleration test in which the significant amount of vibration registers only for a short time. Pressing EXIT or the FREEZE button again deactivates the freeze function.

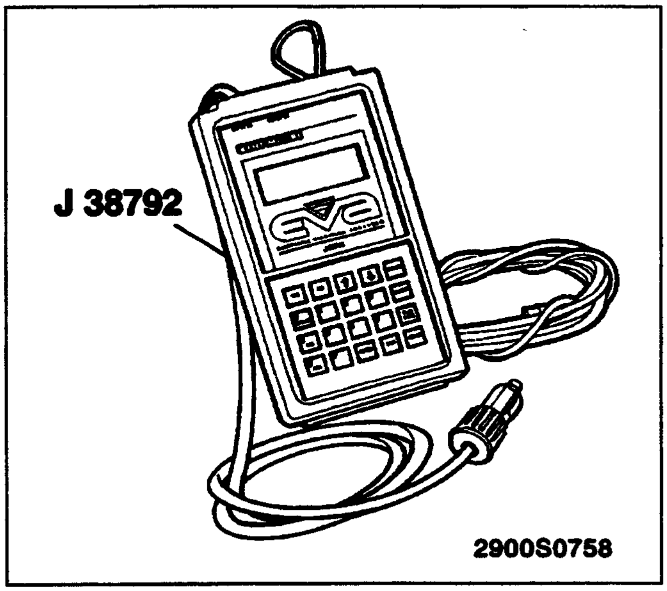


Figure 17—Electronic Vibration Analyzer (EVA)

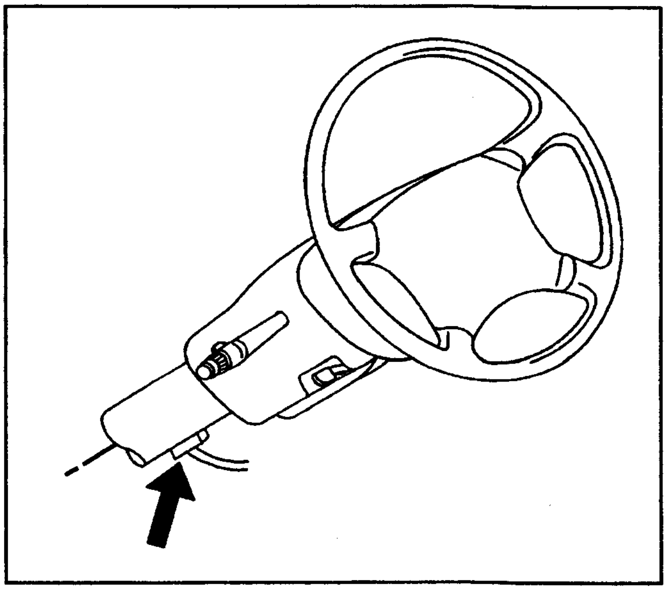


Figure 18—EVA Sensor Position-Steering Column

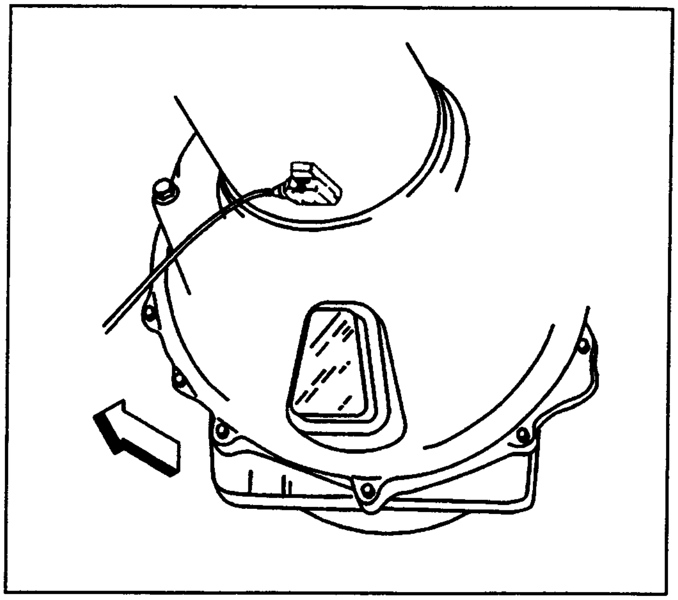


Figure 19—EVA Sensor with Magnet

Record/Playback

The displayed vibration information can be recorded for later playback. The EVA retains stored data for about 70 hours after the unit has been unplugged from a power source. Data is recorded as SNAPSHOTS of vibration information. Each snapshot consist of 10 different frames. Up to 10 of these snapshots can be recorded.

Press RECORD in order to record a snapshot. The screen will display R? in order to request a tag number between 0 and 9. These tag numbers are the individual frames of snapshot recording. New data will replace the existing data when a number is chosen that has already been used in order to tag a snapshot.

Pressing PLAYBACK plays back the recorded data. The screen shows P? in order to request the tag number for the wanted snapshot. Once the number is entered, the snapshot data is displayed: P and the tap number will appear. Then, an F and a 0-9 will be displayed in order to indicate which frame of the snapshot is being displayed.

The freeze function can be used in order to freeze the display at any point in the sequence during playback. Individual frames can be viewed in a forward or backward sequence using the UP and DOWN arrow keys.

The display returns to the active screen when the recording or playback of a snapshot is finished, or when EXIT is pressed.

Averaging/Non-Averaging Modes

The EVA normally operates in an averaging mode that averages multiple vibration samples over a period of time. The averaging mode minimizes the effects of sudden vibration that are not related to the problem (such as from potholes or uneven road surfaces). Most tests use the averaging mode.

The EVA is more sensitive to vibrations in the non-averaging mode. The display is more instantaneous and not averaged over a period of time. The non-averaging mode is used when measuring a vibration that exists for only a short time, and during acceleration/deceleration tests.

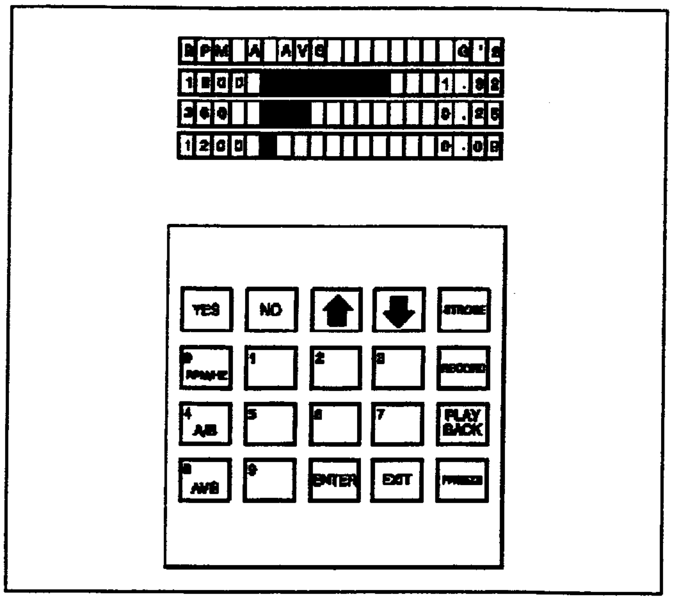


Figure 20—EVA Display Window and Key Pad

Pressing the AVG button switches between the averaging and non-averaging modes. The screen will display AVG.

The EVA can strobe balance a rotating component. A trigger wire is located on top of the EVA, which is used in conjunction with an inductive pick-up light strobe (Figure 21). The EVA triggers the strobe light at the same frequency as the vibration. The timing light clips onto the trigger wire. The vibration sensor must be attached to input A. Input B does not provide strobe function.

Pressing STROBE starts the strobe balancing function. The EVA will ask a series of questions in order to determine the correct filter range: full, low, or high.

The low and high ranges prevent other vibrations from interfering with the operation of the strobe light. Use the full range as a last resort only. Press YES in order to select a range. Press NO in order to go on to the next range. The vibration/strobe frequency must fall within the selected range.

The EVA will display the strobe frequency, amplitude, and filter range. The EVA is now ready to begin the strobe balance procedure.

EVA Calibration

The EVA features the following two built-in calibration procedures:

- Sensor Calibration
- Phase Shift Calibration

A replaced or added sensor must be calibrated in order to function properly with the EVA unit. The phase shift calibration is performed at the factory and should not be repeated under normal use.

Sensor Calibration

1. Lay the sensor on a flat stationary surface with the UP side facing upward.
2. Plug the sensor into either input A or B.
3. Plug the EVA into a 12-volt power supply.
4. After the display initializes, select the proper input.
5. Press the UP arrow key.

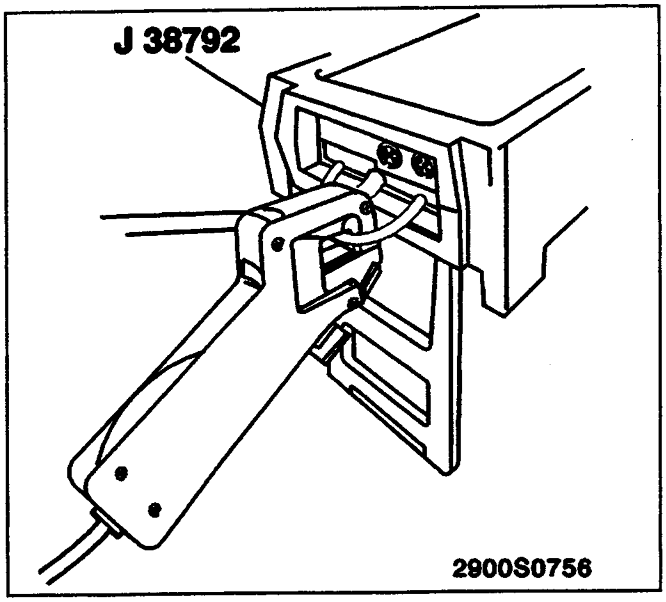


Figure 21—EVA Inputs and Connections

6. Press the number 2 three times on the keypad. The message BURNING will appear, followed by a request to turn the sensor over.
7. Turn the sensor over.
8. Press the key in order to commence calibration:
    - Calibration will take about 20 seconds.
    - The display will return to the active mode when calibration is complete.

Phase Shift Calibration

1. Plug the EVA into a 12-volt power supply.
2. Press the DOWN arrow key on the EVA keypad.
3. Press the number 2 three times in order to begin calibration:
    - Do not press any key until the message ANY KEY TO CONTINUE appears. Pressing a key will cancel the calibration process.
    - The display will flash numbers for 5-6 minutes. (If the numbers flash for more than 10 minutes, the EVA is defective.)
    - The message BURNING PHASE SHIFT CONSTANTS will appear for one minute.
    - The BURNING CENTER FREQUENCIES LOW=39 HIGH=48 message will appear.
    - The ANY KEY TO CONTINUE message should appear.
4. Press any key in order to return to the active mode.

VIBRATION DIAGNOSIS

VIBRATION CLASSES

Vibration problems can be classified into sensitivity categories. Many problems fit into one or more categories. These categories can usually be combined into one of the following "classes" of categories:

- Vehicle Speed Sensitive Only
- Torque Sensitive and Vehicle Speed Sensitive
- Torque Sensitive, Speed Sensitive, and Jounce Sensitive

The first step in correcting a vibration problem is to determine which of the above best describe the problem. The second step is to determine the vehicle speed at which the vibration occurs or is most intense.

VIBRATION CATEGORIES

There are several excitation sources and many responding systems which may cause a vibration complaint. Most vibrations are caused by wheel and tire disturbances or drive line imbalances. Each of these categories has a specific vibration associated with it. By systematically classifying the vibration into one of the following categories, many components can be eliminated as the source.

Payload or Jounce Sensitive

A payload or jounce sensitive vibrations vary in intensity as the height of the vehicle varies with respect to the surface of the road. The vibration reacts to the extension or compression of the springs. Apply the following procedure in order to determine if a vibration is payload or jounce sensitive:

1. Drive the vehicle and observe the disturbance with varying payload.
2. Drive the vehicle over a road that dips in such a way that it causes the rear of the vehicle to move up and down relative to the surface of the road. Keeping a constant throttle, notice when the disturbance occurs.
3. Record when the vibration problem occurs.

If the vibration problem occurs when the vehicle height changes due to payload, or when driving on a road that cause the vehicle to dip, then the vibration is payload or jounce sensitive.

Torque Sensitive

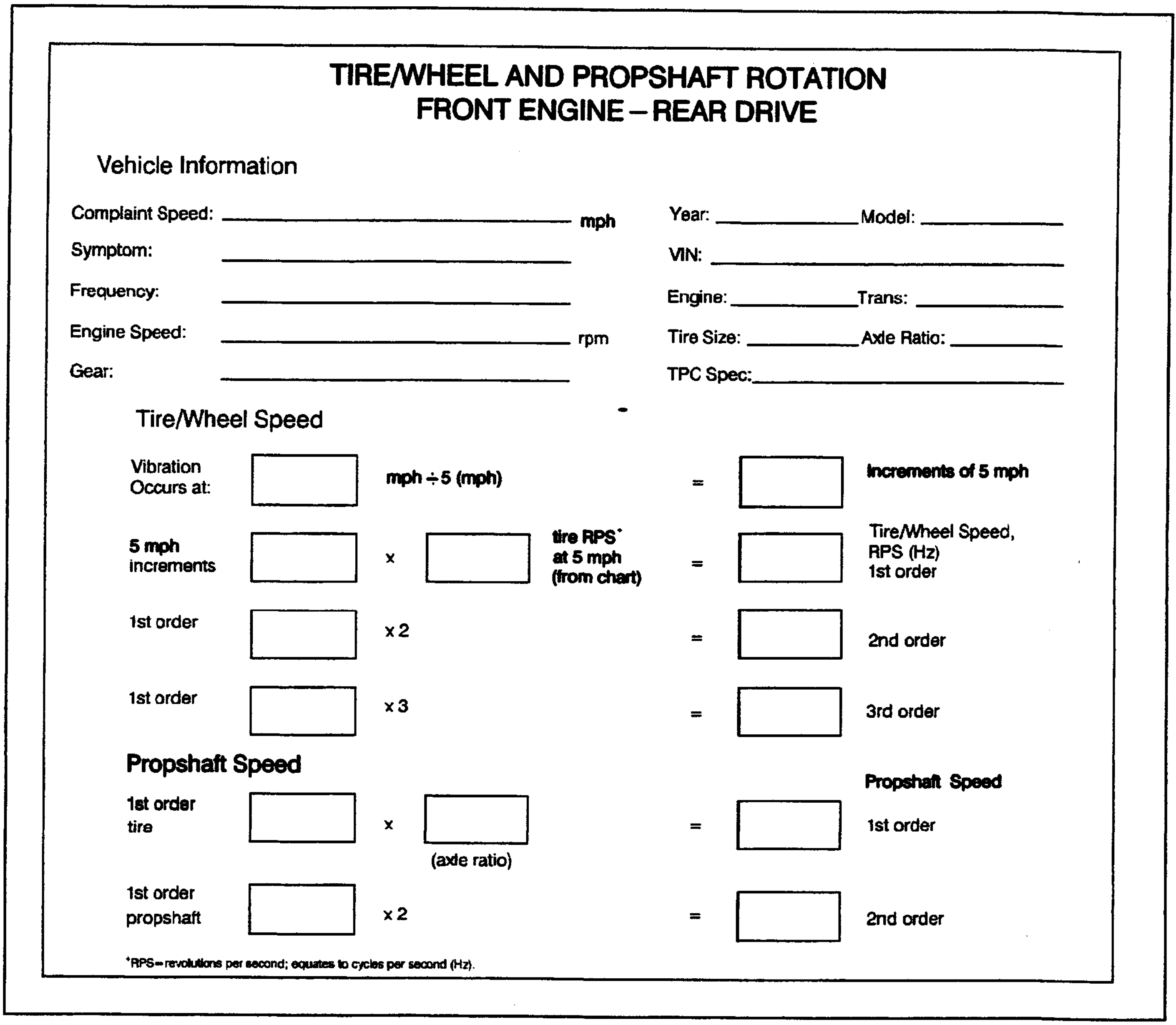
A torque sensitive problem is one which increases in intensity as the torque (power) output of the motor increases. The intensity of the vibration increases as the accelerator pedal is pressed.

Torque sensitivity can be determined as follows:

1. Drive the vehicle and locate the vibration. Record the vehicle speed and pressure on the accelerator pedal at which the problem occurs.
2. Note the vibration while varying the pressure on the accelerator pedal. Drive the vehicle with steady pressure on the accelerator pedal, slowly increasing to heavy pressure on the accelerator pedal by going up hill. Or apply the brakes while pressing on the accelerator pedal then slowly relieve pressure pedal pressure to minimum and coast during the vibration.
3. If the vibration becomes more severe as the accelerator pedal is pressed, the vibration is torque sensitive. An increase in torque usually changes the pinion angle.

TECHNICIAN VIBRATION DIAGNOSIS FORM

The following Technician Vibration Diagnosis Form (Figure 22) is used for diagnosing a vibration problem:



TIRE/WHEEL AND PROPSHAFT ROTATION FRONT ENGINE – REAR DRIVE

Vehicle Information

Complaint Speed: ______________ mph
Symptom: ______________
Frequency: ______________
Engine Speed: ______________ rpm
Gear: ______________

Year: __________ Model: __________
VIN: ______________
Engine: __________ Trans: __________
Tire Size: __________ Axle Ratio: __________
TPC Spec: ______________

Tire/Wheel Speed

Vibration Occurs at: ☐ **mph ÷ 5 (mph)** = ☐ **Increments of 5 mph**
5 mph increments ☐ x ☐ **tire RPS* at 5 mph (from chart)** = ☐ Tire/Wheel Speed, RPS (Hz) 1st order
1st order ☐ x 2 = ☐ 2nd order
1st order ☐ x 3 = ☐ 3rd order

Propshaft Speed

Propshaft Speed
1st order tire ☐ x ☐ (axle ratio) = ☐ 1st order
1st order propshaft ☐ x 2 = ☐ 2nd order

*RPS = revolutions per second; equates to cycles per second (Hz).

Figure 22—Technician Vibration Diagnosis Form

VIBRATION DIAGNOSIS (NOISE)

Step	Action	Value(s)	Yes	No
1	1. Road test the vehicle with the customer (if possible) in order to point out the noise and/or vibration problem. 2. Check tire condition and pressures. 3. Use a P/N 313510 Reed Tachometer in order to identify vibration frequency. Is the problem a vibration-only problem?	—	Go to *Step 2*	Go to *Step 3*
2	Run the motor up in Neutral. Is there a vibration problem?	—	Replace Drive Unit	Go to *Step 3*
3	Is there a Moan (noise-only) problem?.	—	Go to *Step 4*	Go to *Step 5*
4	Inspect for the following: • All mounting brackets and bolts for tightness. • Grounded A/C lines. • Grounded exhaust system Correct as necessary. Are the repairs complete?	—	System OK	—
5	Is there a Boom (noise and vibration) problem?.	—	Go to *Classifying the Vibration (Boom)*	—
DEFINITIONS: • VEHICLE SPEED—Speedometer (vehicle speed) related or dependent. • MOAN—A low frequency noise which sounds like exhaust noise. It is motor RPM and/or torque sensitive. Most customers will complain of noise such as vibration or buzz in the floor. • BOOM—A drum sound which occurs on impact with a hole or seams in the road. The sound then dies out. There could be a vibration component along with the drumming sound.				

CLASSIFYING THE VIBRATION (BOOM)

Step	Action	Value(s)	Yes	No
1	Inspect the body-to-frame grounds and correct any problems, if necessary. Does the boom problem still exist?	—	Go to *Step 2*	System OK
2	Check for any sensitive body panels. Does the condition still exist?	—	Go to *Step 3*	System OK
3	If the vehicle is equipped with a heavy duty suspension, a degree of boom is considered normal. This must be explained to the customer.	—	—	—

ROAD TESTING

Road test the vehicle in order to isolate and diagnose the source of a vibration. Use a systematic approach in narrowing the possible causes of a vibration. The following questions can eliminate many components as possible vibration sources:

1. When did the vibration start?
2. Did the vibration start after any of the following repair procedures?
    - Undercoating
    - Tire Repair or Replacement
    - Wheel Alignment
    - Drive Motor Repair

Most vibration problems involve one or more of the following four major component groups:

- Motor Mounts
- Tires
- Wheels
- Brake Rotors and Drums

Before road testing a vehicle, check the following common trouble spots:

- Wheel lugs
- Tire air pressure
- Payload conditions
- Motor mount fasteners

Road Test

The road test can help determine the location, either forward or aft, of the vibration source. The vibration is likely to be felt in the steering wheel or in the seat cushion. Refer to Reed Tachometer or Electronic Vibration Analyzer (EVA) in this section. Record the speed at which the greatest vibration occurs.

Coast Test

The coast test usually detects two types of vibration, shaking and buzzing. A shaking vibration usually indicates a wheel and brake assembly problem. A buzzing vibration usually indicates a drive line problem. To perform the coast test apply the following procedure:

1. Drive the vehicle past the vibration speed.
2. Shift the vehicle into neutral.
3. Coast back through the vibration speed.

ON-VEHICLE SERVICE—TIRE AND WHEEL VIBRATIONS

CORRECTING TIRE AND WHEEL VIBRATION

A first order tire and wheel vibration is usually the result of one of the following five conditions:

- Excessive radial runout
- Excessive lateral runout
- Excessive imbalance
- Excessive radial force variation
- Excessive lateral force variation

These conditions must be eliminated one at a time in order to attain a set of tires that are free from vibration causing elements. Substitute a set of tires from another vehicle only as a last resort, and only after the tires have been tested on a similar vehicle under the same conditions. Correcting the existing tire and wheel assemblies is the most accurate and least time consuming approach. This is due to vehicle-to-vehicle sensitivities and the differences between the hubs of any two vehicles.

TIRE AND WHEEL ASSEMBLY RUNOUT

The tire and wheel assembly runout will directly affect the amount of imbalance and the radial force variation. Therefore, correct the runout first before further diagnosis. The less runout, the less imbalance and radial force vibration. Radial and lateral runout can be corrected at the same time. There are two methods for correcting the tire and wheel assembly runout:

- The on-vehicle method, with the tire and wheel assembly mounted on the hub. The wheel bearing must be in good condition.
- The off-vehicle method, with the tire and wheel assembly mounted on a spin-type tire balancer.

Perform the following initial on-vehicle inspections prior to the off-vehicle runout checks:

1. Inspect the tires for any uneven bead seatings. The distance from the edge of the ring to the concentric rim locating ring should be equal around the entire circumference.
2. Properly mount the tires if the beads are not seated properly in order to avoid excessive runout and imbalance.

The off-vehicle method is the easiest way of measuring the tire and wheel runout (Figure 23). Properly mounting the dial indicator in the correct location in relation to the tire (1) is easier. The dial indicator is less likely to be subjected to water, snow, dirt, or other elements. After measuring the correct runout off-vehicle, inspect the runout with the tire and wheel assembly mounted on the vehicle. The runout measurement may vary greatly between these two methods. If so, the runout is due to one of the following conditions:

- Stud circle runout
- Hub flange runout
- A mounting problem between the wheel and the vehicle

MEASURING TIRE/WHEEL ASSEMBLY RUNOUT

If the vehicle has been sitting in one place for an extended period of time, the tires may develop flat spots at the point where the tires were resting on the ground. These flat spots will affect the runout readings. In order to eliminate these flat spots, drive the vehicle long enough to warm up the tires. The flat spots must be eliminated prior to taking any runout measurements.

Measurement Procedure

1. Raise and suitably support the vehicle. Refer to General Vehicle Lifting and Jacking in General Information.
2. Obtain an initial indication of how much runout exists:
   A. Spin each tire and wheel assembly on the vehicle by hand (or at a slow speed using the engine to run the drive wheels).
   B. Visually inspect the amount of runout from the front or rear of the tire.
3. Matchmark each of the tire and wheel assemblies in relation to the wheel studs and to their position on the vehicle (LF, LR, RF, RR) for future reference.

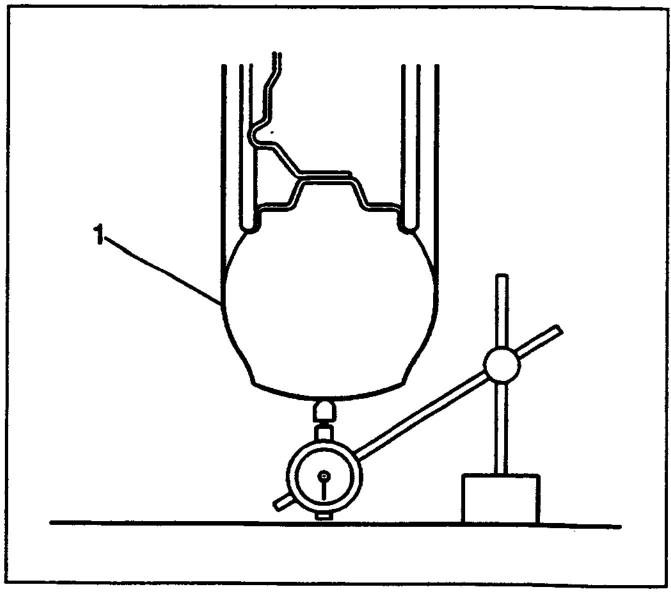


Figure 23—Measuring Off-Vehicle Runout

4. Remove the tire and wheel assemblies one at a time and mount on a spin-type wheel balancer. Refer to Wheel Removal in Tires and Wheels. Locate the tire and wheel assembly on the balancer with a cone through the back side of the center pilot hole.
5. Wrap the outer circumference of tires that use an all-season or aggressive tread pattern with tape (1), in order to accurately measure the radial runout (Figure 24).
6. Measure the tire and wheel assembly radial runout:
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

   Maximum Radial Runout:

   - Measured off-vehicle: 1.27 mm (0.050 in)
   - Measured on-vehicle: 1.52 mm (0.060 in)
7. Measure the tire and wheel assembly lateral runout. Lateral runout should be measured on a smooth area of the sidewall as close to the tread as possible. Ignore any jumps or dips due to sidewall splices and attain an average amount of runout (Figure 25).
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

   Maximum Lateral Runout:

   - Measured off-vehicle: 1.27 mm (0.050 in)
   - Measured on-vehicle: 1.52 mm (0.060 in)
8. Make the necessary repairs to the tire and wheel assembly.
9. Install the tire and wheel assembly to the vehicle. Refer to Wheel Installation in Tires and Wheels.
10. Repeat the procedure until all the wheel runouts have been measured.
11. Lower the vehicle.

MEASURING WHEEL RUNOUT

If tire and wheel assembly runout cannot be brought within tolerance, measure the wheel runout.

If any runout measurement of a wheel exceeds specifications, the wheel should be replaced. (ALWAYS measure the runout of a new wheel.)

If the runout of the wheel is within tolerance, and the tire and wheel assembly runout cannot be reduced to an acceptable level, the tire should be replaced. (ALWAYS measure the tire and wheel assembly runout after replacing the tire.)

Measurement Procedure

1. Raise and suitably support the vehicle. Refer to Vehicle Lifting and Jacking in General Information.
2. Matchmark each of the tire and wheel assemblies in relation to the wheel studs and to their position on the vehicle (LF, LR, RF, RR) for future reference.

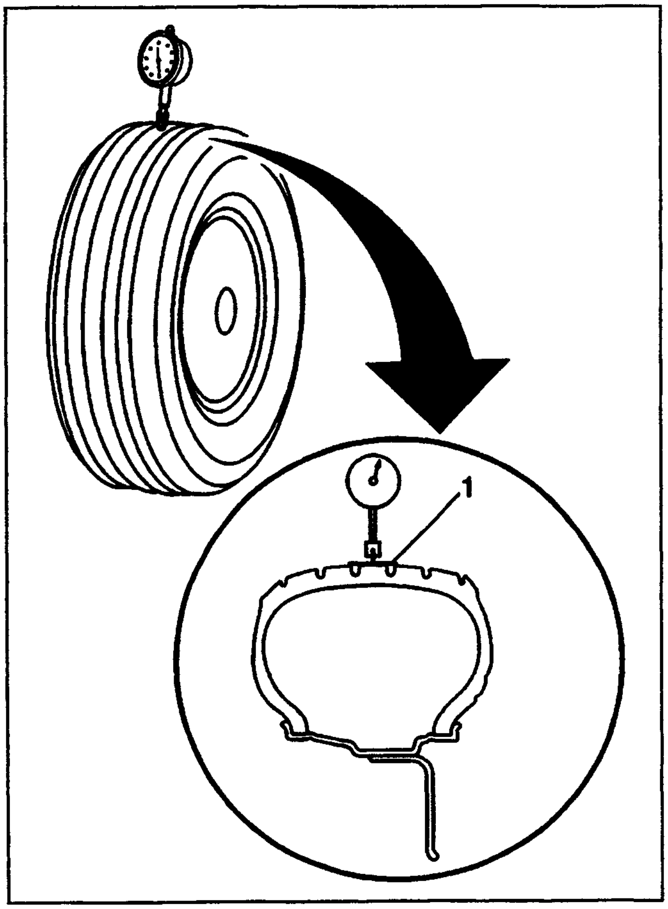


Figure 24—Measuring Radial Runout

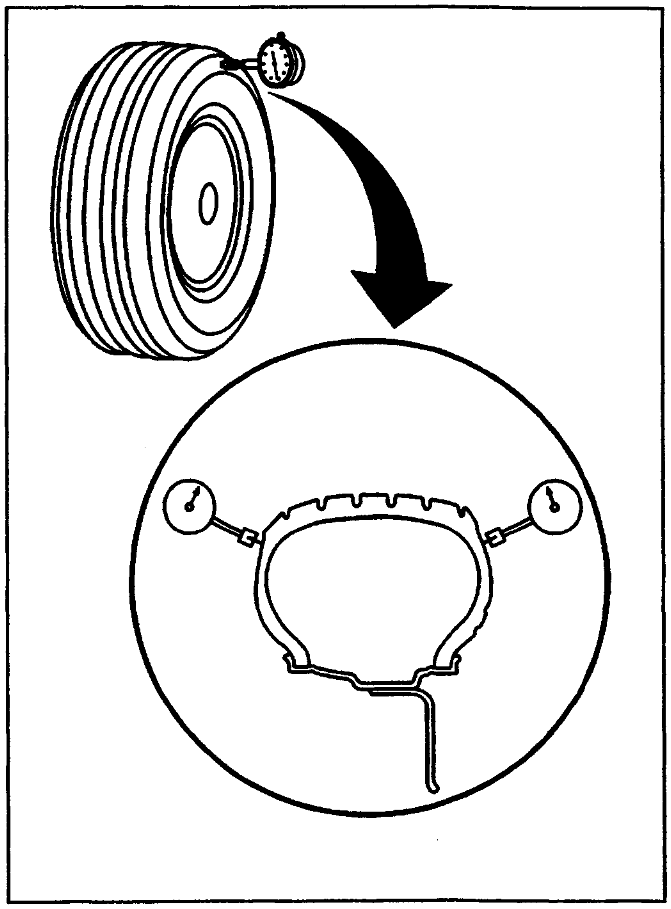


Figure 25—Measuring Lateral Runout

3. Remove the tire and wheel assemblies one at a time and mount on a spin-type wheel balancer. Refer to Wheel Removal in Tires and Wheels. Locate the tire and wheel assembly on the balancer with a cone through the back side of the center pilot hole.
4. Measure the wheel radial runout on the outside of the wheel (with the tire mounted), if the wheel design allows. Wheel runout should be measured on both the inboard and outboard rim flanges. Ignore any jumps or dips due to paint drips, chips, or welds (Figure 26).
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

   Maximum Lateral Runout:

   - Steel Wheel—1.015 mm (0.040 in)
   - Aluminum Wheel—0.762 mm (0.030 in)
5. Measure the wheel lateral runout on the outside of the wheel (with the tire mounted), if the wheel design allows. Wheel runout should be measured on both the inboard and outboard rim flanges. Ignore any jumps or dips due to paint drips, chips, or welds (Figure 27).
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

   Maximum Lateral Runout:

   - Steel Wheel—1.143 mm (0.045 in)
   - Aluminum Wheel—0.762 mm (0.030 in)
6. If the wheel design does not allow runout measurements to be made with the tire mounted, dismount the tire from the wheel. Refer to Tire Mounting and Dismounting in Wheels and Tires.

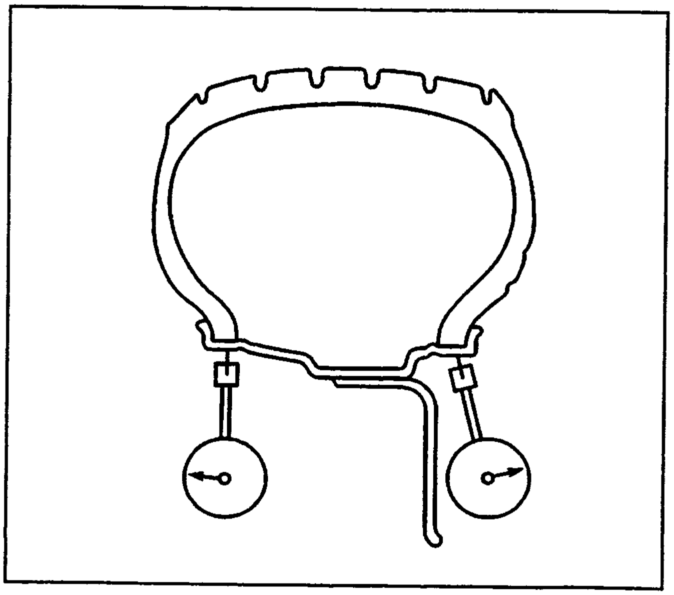


Figure 26—Measuring Wheel Radial Runout

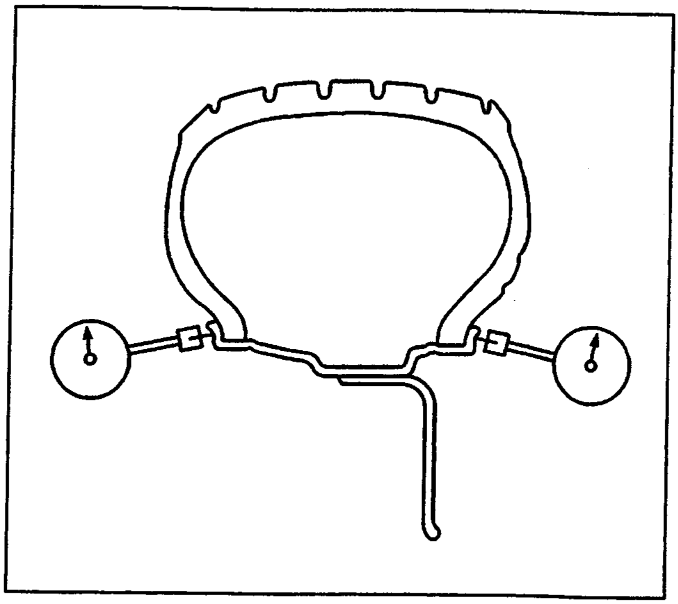


Figure 27—Measuring Wheel Lateral Runout

7. Measure the wheel radial runout on the inside of the wheel (Figure 28). Wheel runout should be measured on both the inboard and outboard rim flanges. Ignore any jumps or dips due to paint drips, chips, or welds.
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

   Maximum Lateral Runout:

   - Steel Wheel—1.015 mm (0.040 in)
   - Aluminum Wheel—0.762 mm (0.030 in)

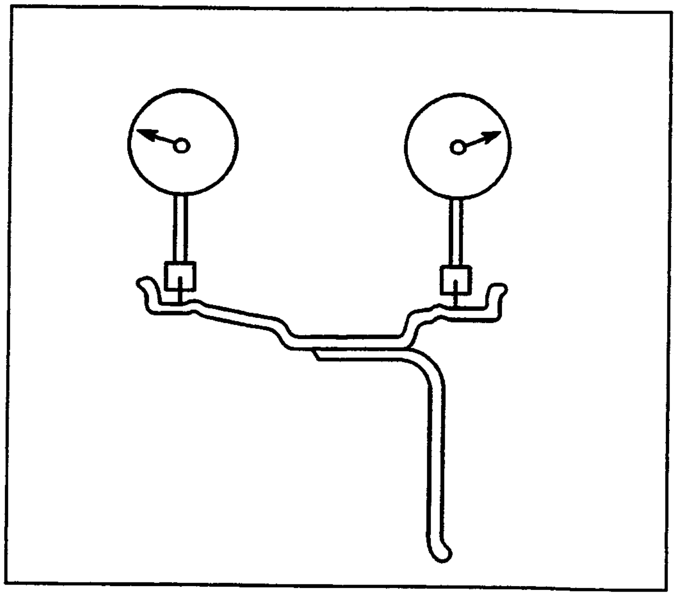


Figure 28—Measuring Inside Wheel Radial Runout

8. Measure the wheel lateral runout on the inside of the wheel (Figure 29). Wheel runout should be measured on both the inboard and outboard rim flanges. Ignore any jumps or dips due to paint drips, chips, or welds.
   A. Slowly rotate the tire and wheel assembly one complete revolution and ZERO the dial indicator on the low spot.
   B. Rotate the assembly one more complete revolution and note the total amount of runout indicated.

      Maximum Lateral Runout:
      - Steel Wheel—1.143 mm (0.045 in)
      - Aluminum Wheel—0.762 mm (0.030 in)
9. Make the necessary repairs to the tire and wheel assembly.
10. Install the tire and wheel assembly to the vehicle. Refer to Wheel Installation in Tires and Wheels.
11. Repeat the procedure until all the wheel runouts have been measured.
12. Lower the vehicle.

VECTORING

Vectoring is a technique used to reduce radial or lateral runout—and to even dynamic balance on the tire and wheel assemblies. Vectoring can be accomplished by the positioning of the tire and wheel assembly on the hub or rotor.

Tire to Wheel Vectoring (Excessive Wheel Runout)

Do the following to reduce radial/lateral runout (wheel is a major contributor):

Important

- Always rebalance the tire and wheel assembly after vectoring.

1. Determine visually which runout needs to be minimized.
2. If the radial runout is the problem, take a measurement on the center tread rib.
3. If the tread is uneven, wrap tape tightly around the tire, record the runout magnitude, and mark the high spot location (4). Refer to Figure 30.
4. If the lateral runout is the problem, take a measurement on the sidewall just below the edge of the tread shoulder.
5. Record the runout magnitude and mark the high spot location (4).
6. Mark the tire sidewall at the valve location (3). This is the 12 o'clock position (6). The location of the high spot is always with respect to the clock location on the wheel.
7. Break the tire and wheel assembly down on a tire mounting machine and rotate the tire six hours (180 degrees) on the rim (8).
   - Reinflate the tire and measure the runout in question.
   - Record the magnitude and location of the high spot (valve stem is 12 o'clock) (7).
8. If the clock location of the high spot remained at or near the clock location of the original high spot, the rim is the major contributor to the runout problem (4, 7)
   - Confirm by removing the tire from the wheel and check the wheel rim runout.
   - If the wheel rim runout exceeds specification, replace the wheel.

Tire to Wheel Vectoring (Excessive Tire Runout)

Do the following to reduce radial/lateral runout (wheel is a major contributor):

Important

- Always rebalance the tire and wheel assembly after vectoring.

1. Determine visually which runout needs to be minimized.
2. If the radial runout is the problem, take a measurement on the center tread rib.
3. If the tread is uneven, wrap tape tightly around the tire, record the runout magnitude, and mark the high spot location (3). Refer to Figure 31.

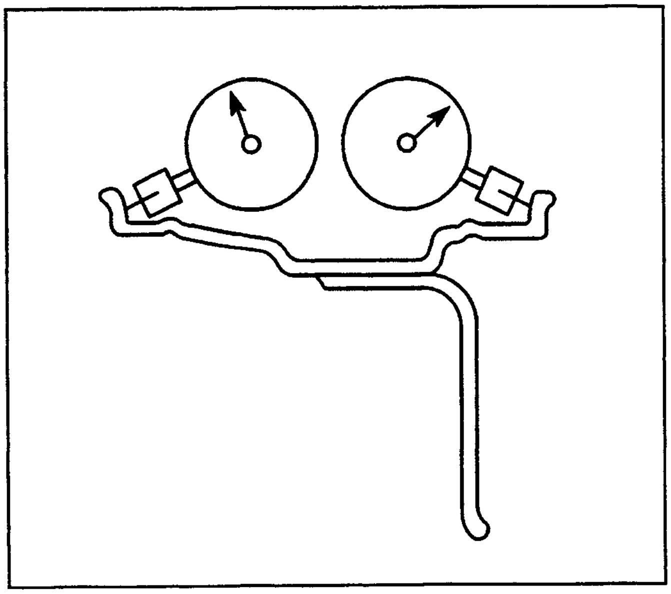


Figure 29—Measuring Inside Wheel Radial Runout

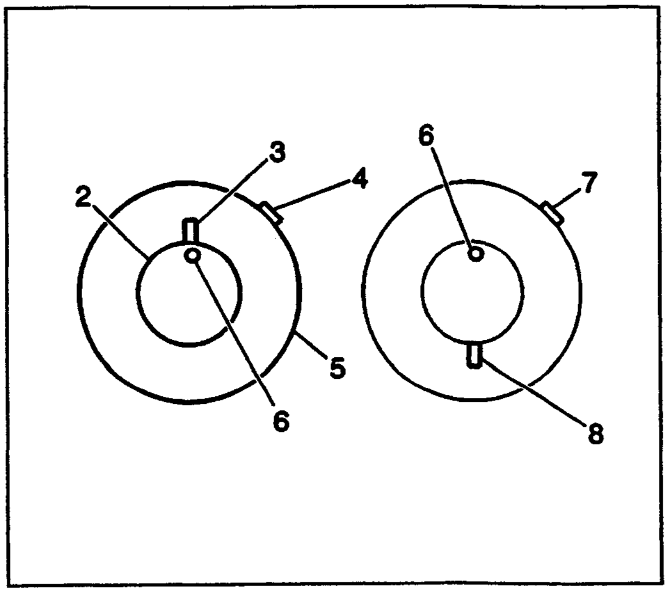


Figure 30—Vectoring-Excessive Wheel Runout

4. If the lateral runout is the problem, take a measurement on the sidewall just below the edge of the tread shoulder.
5. Record the runout magnitude and mark the high spot location (3).
6. Mark the tire sidewall at the valve location (3). This is the 12 o'clock position (6). The location of the high spot is always with respect to the clock location on the wheel.
7. Break the tire and wheel assembly down on a tire mounting machine and rotate the tire six hours (180 degrees) on the rim (7).
   - Reinflate the tire and measure the runout in question.
   - Record the magnitude and location of the high spot (valve stem is 12 o'clock) (7).
8. If the clock location of the high spot is 6 hours from the original high spot, the tire is the major contributor to the runout problem. Replace the tire (3, 8).
9. After correcting the tire to wheel vectoring, rebalance the tire and wheel assembly.

Tire and Wheel Assembly to Hub/Rotor Vectoring

This compensates for any imbalance in the brake rotor, drum, or wheel cover. Do the following to reduce radial/lateral runout:

1. Mark the wheel hub bolt nearest the valve stem for reference (1).
2. Rotate the assembly two wheel hub bolts and recheck the runout (2).
   - Several positions may have to be tried to locate the optimum position.
   - This can be effective for both radial and lateral runout.
3. If there is some looseness in the wheel hub bolt holes, radial runout can be reduced by loosening the hub bolts nuts slightly, moving the wheel position on the bolts and then retightening the nuts.
4. Balance the tire and wheel to the hub/rotor assembly.

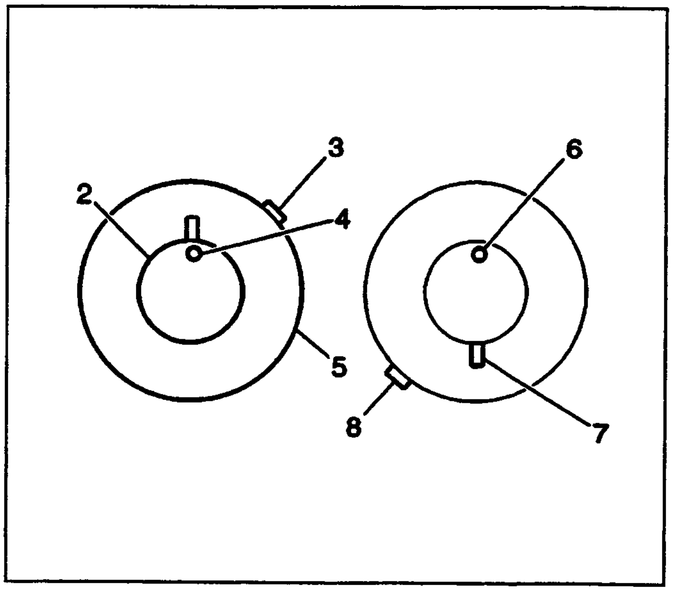


Figure 31—Vectoring-Excessive Wheel Runout

BALANCING TIRES AND WHEELS

CAUTION: Failure to adhere to the following precautions before tire balancing can result in personal injury or damage to components:

1. **Clean away any dirt or deposits from the inside of the wheels.**
2. **Remove any stones from the tread.**
3. **Wear eye protection.**
4. **Use coated weights on aluminum wheels.**

Important

- The tires can be balanced either on-vehicle or off-vehicle, but the off-vehicle methods are better because tire rotation will not affect the balancing. The off-vehicle balancers are also more accurate than the on-vehicle balancers. Off-vehicle balancers can perform dynamic balancing as well as static balancing.

Tire and wheel balancers can drift out of calibration without warning, or can become inaccurate as a result of abuse. The balancer calibration should be inspected every two weeks, and whenever the readings are questionable.

Tire Balancer Calibration Test

1. Spin the balancer without a wheel or any of the adapters on the shaft.
2. Inspect the balancer readings.
   Specification:
   0.00 —0.25 oz
3. Balancer a tire and wheel assembly that is within radial and lateral tolerances to ZERO.
4. Add a 3 ounce test weight to the wheel at any location.
5. Spin the tire and wheel assembly again, noting the readings.
   - In the static and dynamic modes, the balancer should call for 3 ounces of weight, 180 degrees opposite the test weight.

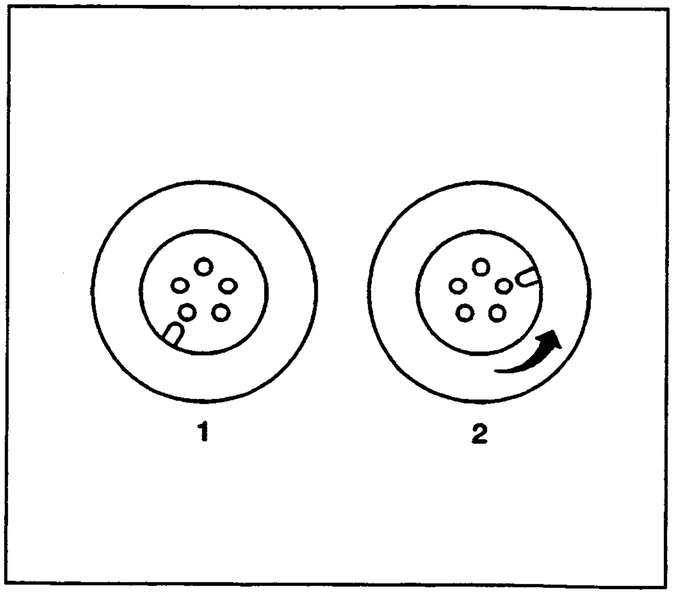


Figure 32—Hub/Rotor Vectoring

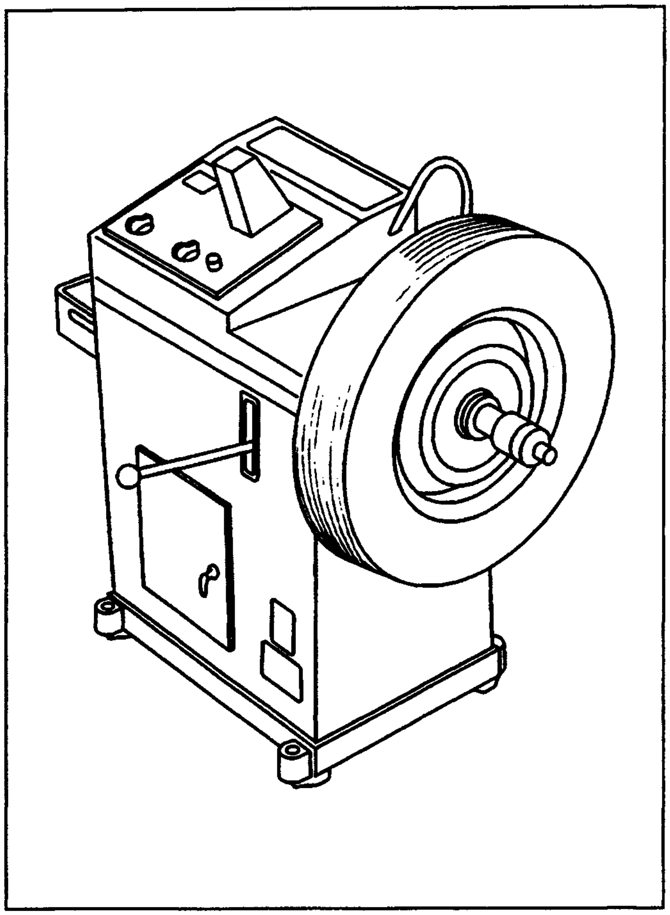


Figure 33—Off-Vehicle Wheel Balancer

  - In the dynamic mode only, the weight should be called for on the flange of the wheel opposite the last weight.

6. With the assembly unbalanced to 3 ounces, cycle the balancer 5 times.
7. Take the balancer readings:
   Specification
   Variation: 0.25 oz or less
8. Index the tire and wheel assembly at four separate locations on the balancer shaft, 90 degrees apart.
9. Cycle the balancer with the assembly at each location.
10. Take the balancer readings:
    Specification
    Variation: 0.25 oz or less

Tire Balancing Guidelines

There are two methods used to balance tire and wheel assemblies:

- Static balance is the equal distribution of weight around the wheel. The wheel balance weights (2) are positioned on the wheel in order to offset the effects of the heavy spot (3). Wheels that are statically unbalanced produce a bouncing action called tramp (Figure 34).
- Dynamic balance is the equal distribution of weight on each side of the spindle centerline (1). The wheel balance weights (2) are positioned on the wheel in order to offset the effects of the heavy spot (3). When the tire spins, the equal distribution of weight eliminates the tendency for the wheel to move from side to side. Wheels that are dynamically unbalanced may cause shimmy (Figure 35).

Most off-vehicle balancers are capable of checking both types of balance simultaneously.

As a general rule, most vehicles are more sensitive to static imbalance than to dynamic imbalance, with as little as 0.50--0.75 oz capable of inducing a vibration in some vehicles.

- Balance all four tires as close to ZERO as possible.
- Carefully follow the wheel balancer manufacturer's instructions for proper mounting techniques to be used on different types of wheels.
- Regard aftermarket wheels, especially those incorporating universal lug patterns, as potential sources of runout and mounting problems.
- Use the correct coated weights on aluminum wheels.
- Recheck the tire and wheel assemblies for excessive runout after they have corrected and installed.

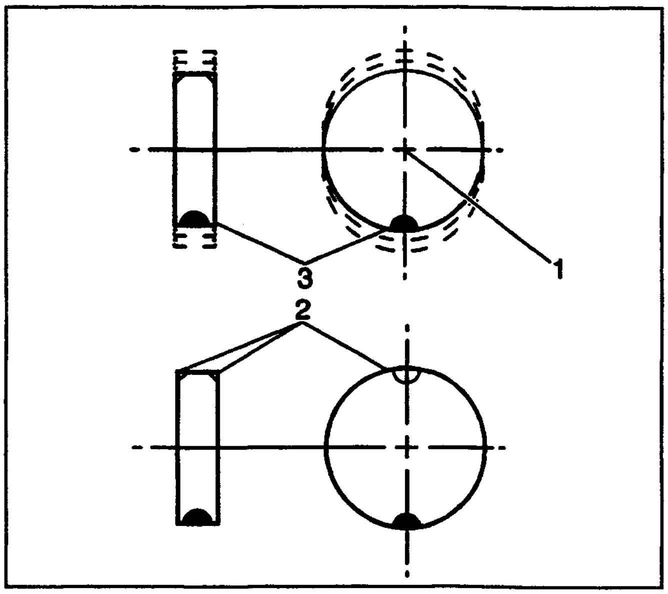


Figure 34—Static Balancing

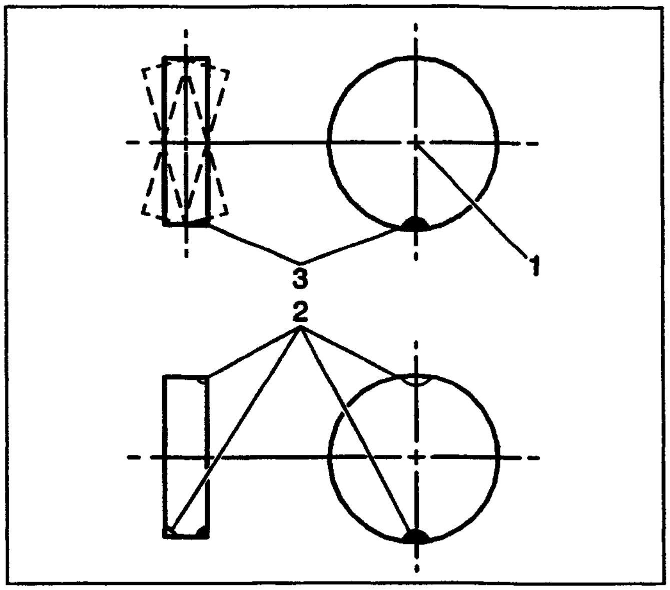


Figure 35—Dynamic Balancing

- Evaluate the vehicle at the complaint speed and note if the vibration has been corrected.
- If the vibration is still present, or is reduced but still unacceptable, you may find one of two possibilities:
  - — On-vehicle imbalance
  - — Radial or lateral force variation

Correcting On-Vehicle Imbalance

On-vehicle imbalance may result from components other than the tire and wheel assemblies having imbalance. An on-vehicle high-speed balance or replacement of suspected components may be necessary in order to correct the condition.

Rotors do not have a set tolerance. However, rotors with more than 0.75 ounce imbalance have the potential to cause vibration. The rotors can be inspected for imbalance using either the on-vehicle or the off-vehicle method as described below:

Checking Rotor Imbalance (On-Vehicle)

1. Support the vehicle rear axle on a suitable hoist. Refer to Vehicle Lifting and Jacking in General Information.
2. Remove the rear tire and wheel assemblies. Refer to Wheel Removal in Tires and Wheels.
3. Reinstall the wheel nuts in order to retain the rotors.
4. Take the necessary precautions. Refer to Work Stall Vibration Test Caution in Cautions and Notices.
5. Run the vehicle at the complaint speed while inspecting for vibration.
6. If the vibration still exists, perform the following steps:
   - A. Remove the rotors. Refer to Rotor in Front Disc Brakes.
   - B. Run the vehicle back to speed.
7. If the vibration is eliminated, perform the following steps:
   - A. Remove the rotors one at a time. Refer to Rotor in Front Disc Brakes.
   - B. Perform the vibration test for each rotor.
   - C. Replace the rotor causing the imbalance.
   - D. Inspect the balance of the new rotor.

Checking Rotor Imbalance (Off-Vehicle)

1. Measure the diameter and the width of the rotor.
2. Mount the rotor on a balancer in the same manner as a wheel.
3. Inspect for static imbalance.

On-Vehicle Balancing Procedure

The vibration problem may not be correctable with the components removed from the vehicle. An on-vehicle high-speed balancer may be required in order to balance the tire and wheel assemblies while still mounted on the vehicle. On-vehicle balancing will balance the hubs and the rotors simultaneously, and will compensate for any residual runout encountered as a result of mounting the tire and wheel assemblies on the vehicle as opposed to off-vehicle balancing.

Follow the on-vehicle balancer manufacturer operator's manual for specific instructions while keeping the following tips in mind:

Balancing Tips

- Do not remove the off-vehicle balancing weights. The purpose of on-vehicle balance is to FINE TUNE the assembly balance already achieved, not to start over again.
- If the on-vehicle balance calls for more than 1 ounce of additional weight, split the weight between the inboard and outboard flanges of the wheel, so as not to upset the dynamic balance of the assembly that was achieved in the off-vehicle balance.
- An EVA vibration sensor placed on the fender of the vehicle during the on-vehicle balance is an excellent indicator of the amplitude of the vibration, and the effect the balance has on the vibration.
- Evaluate the vibration after the on-vehicle balance in order to determine if the vibration condition has been resolved.

RADIAL FORCE VARIATION

Radial force variation is the difference in the stiffness of a tire as the tire rotates and contacts the road. The tire and wheel assemblies have some variation due to splices in the tire plies. These Splices do not cause a problem unless the force variation is excessive. These STIFF SPOTS in the tire (1) can deflect the tire and wheel assembly upward as the assembly contacts the road (Figure 36).

If the tire has only one stiff spot, the spot will deflect the spindle once per each revolution of the tire and wheel assembly, thus causing a first-order tire/wheel vibration. If the tire has two stiff spots, the spots cause a second-order vibration. First and second-order tire/wheel vibrations are the most common to occur as a result of radial force variation. Third, fourth, or higher orders are possible but rarely occur.

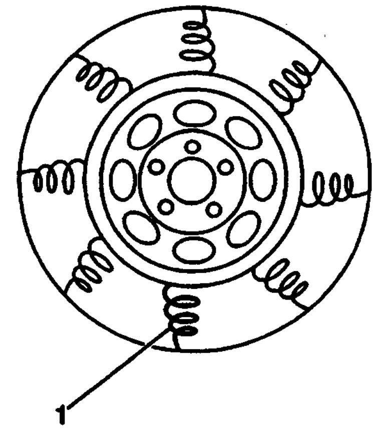


Figure 36—Stiff Spots in Tire

The most effective way to minimize the possibility of force variation as a factor in tire and wheel assembly vibrations is to ensure that the tire and wheel assembly runout is at an absolute minimum. However, some tire and wheel assemblies exhibit vibration-causing force variation even though they are within runout and balance tolerances. These instances are becoming rare due to tighter tolerances and higher standards in manufacturing.

The following two alternatives are available if force variation is suspected as a factor in tire and wheel assembly vibration complaints:

- Buff the tires.
- Substitute one or more known good tire and wheel assemblies.

The tires may be buffed on a tire matching machine that is designed to remove small amounts of rubber from the outer rows of the tread blocks at the location of the stiff spots under load. This eliminates the spindle deflection. This type of equipment is not currently in widespread use. Do not use a TRUER or any tool that is designed to make the tire perfectly round. These tools will not correct the condition.

You may substitute one or more known good tire and wheel assemblies when a tire manufacturer is not available locally.

LATERAL FORCE VARIATION

Lateral force variation tends to deflect the vehicle sideways or laterally. Lateral force variation is based on the same concept as radial force variation. A SNAKY belt inside the tire may be the cause of lateral force. The tire substitution method may have to be used before tire replacement.

A lateral force variation condition is rare. The best way to eliminate lateral force variation as a factor in tire and wheel vibration conditions is to ensure that the lateral runout of the tire and wheel assemblies is at an absolute minimum.

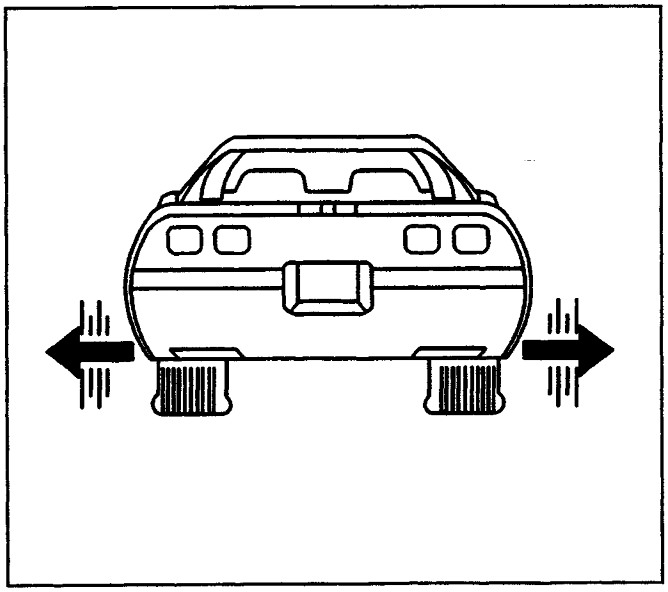


Figure 37—Lateral Force Variation

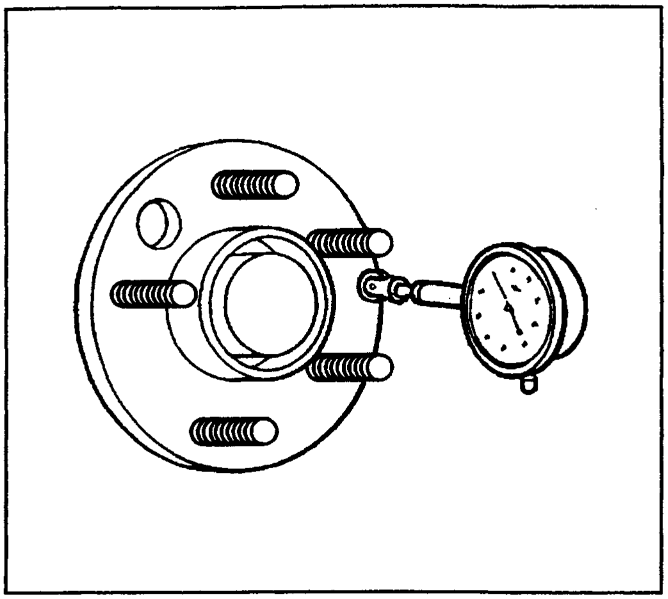


Figure 38—Measuring Wheel Hub Flange Runout

The vehicle will WOBBLE or WADDLE at slow speeds of 8-40 km/h (5-25 mph) when lateral force variation is excessive. This condition is usually related to the first-order of tire and wheel rotation.

WHEEL HUB/AXLE FLANGE RUNOUT

Inspect the wheel hub/axle flange runout when lateral runout occurs during on-vehicle testing but not during off-vehicle testing. The tolerances provided are only guidelines. Perform corrections only if the on-vehicle runout cannot be brought to within tolerance.

1. Position the dial indicator on the machined surface of the hub, the axle flange, or the rotor, outside of the wheel studs.
2. Rotate the hub in order to find the low spot.
3. Set the dial indicator to zero at the low spot.

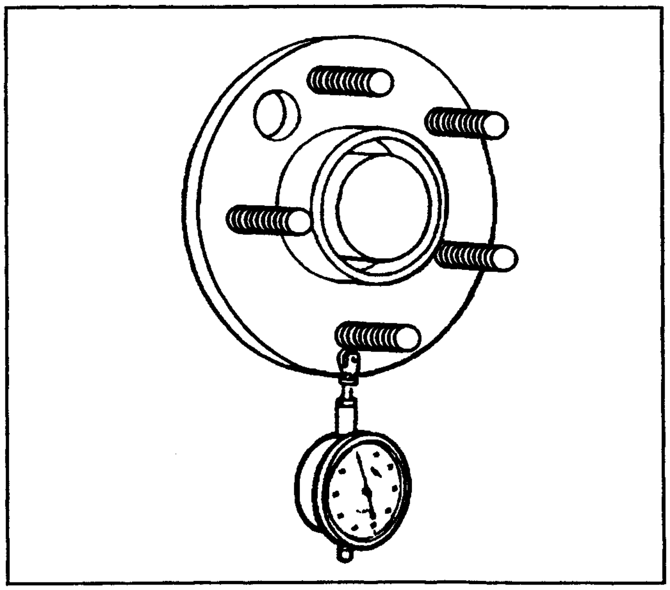


Figure 39—Measuring Wheel Stud Runout

4. Rotate the hub again and check the total amount of runout.

   Specification (Guideline)

   Runout tolerance: 0.127 mm (0.005 in)

WHEEL STUD (STUD CIRCLE) RUNOUT

Use the following procedure whenever the off-vehicle radial runout and the on-vehicle radial runout are significantly different, and the earlier attempts to correct the tire and wheel vibration condition have not been successful:

1. Position the dial indicator in order to contact the wheel mounting studs. Measure the stud runout as close to the flange as possible.
2. Turn the hub to register on each of the studs.
3. Zero the dial indicator on the lowest stud.
4. Rotate the hub again and check the total amount of stud runout.

   Specification (Guideline)

   Runout tolerance: 0.254 mm (0.010 in)

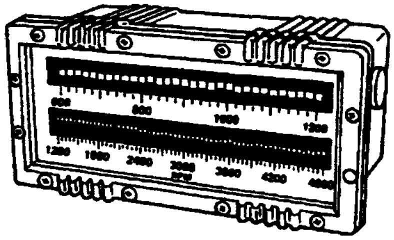
CORRECTING NON-UNIFORM TIRES

Use the following two methods to correct tires which cause a vibration, although the tires are balanced properly:

1. This method uses an automatic machine that loads the tire and buffs small amounts of rubber from high spots on the outer two tread rows.
   - Using this method in order to correct the tires is usually permanent. This method does not significantly affect the appearance of the tire tread life.
   - Do not true the tires with a blade-type machine. This reduces the tread life substantially, and this often does not permanently correct the problem.
2. The second method is to vector the tire and the wheel assembly. Refer to Tire and Wheel Runout Measurement in this section.

SPECIAL TOOLS

1.



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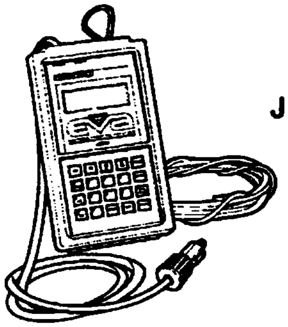

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SECTION 01

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SECTION 1B

HEATER, VENTILATION, AND AIR CONDITIONING

GENERAL DESCRIPTION

HEATER SYSTEM

This vehicle uses two modes of operation for heat depending on the ambient air temperature. The first system consists of a refrigerant compressor, Accessory Power Module (APM), reversing valve assembly, evaporator, condenser, and refrigerant lines. This system uses the air conditioning compressor above 40 degrees. The APM receives a signal from the Heater Ventilation Air Conditioning Thermal Control Module (HTCM) and heated refrigerant gases from the high-side of the air conditioning compressor are forced through the evaporator. A reversing valve assembly that is mounted to the frame also receives a signal from the (HTCM) to switch the refrigerant flow based on ambient air temperature above 40 degrees. [redacted] and the heater switch is depressed, the heater switch sends a signal to the HTCM and Body Control Interface Module (BCIM). This signal in turn, commands the heater assembly ON and heats the coolant.

The heater system provides heating, ram air and power ventilation, side window defogging, and windshield defrosting. Outside air is drawn from the plenum at the base of the windshield into the heater module by the blower fan. Additional outside air, called ram air, is forced into the heater module by the forward movement of the vehicle.

Within the heater module, the air is heated as required and then routed through ducts to the proper outlets for discharge into the passenger compartment. A control assembly in the instrument panel allows the operator to control blower speed, mode of operation and the temperature of the air coming from the heater system.

The heater module contains components that heat the air flowing through it and directs the air to the proper ducts and outlets. The heater module consists of two major assemblies; the heater assembly and the blower assembly. The heater assembly mounts to the rear surface of the cowl panel beneath the instrument panel. The blower assembly mounts to the front surface of the cowl panel under the hood.

Hot coolant from the fuel-fired heater's coolant system is directed through the heater core and returned to the cooling system while the fuel-fired heater is operating. The heater core transfers heat from the coolant to the air passing through the core fins.

HEAT PUMP SYSTEM DESCRIPTION

These vehicles are equipped with a computer-controlled electric heat pump system. This system is unique in automotive applications, and there will be some differences when compared to other vehicles. This system is designed to maintain interior temperature comfort while using as little energy from the battery pack as possible.

The three temperature settings for either air conditioning or heat run the heat pump at different voltages to achieve varied outlet temperatures. The voltages will be different based on the outside ambient temperature.

Example: If the ambient temperature is 36°C (97°F) and the highest setting is selected for air conditioning, the system will begin operation at the highest level of current to obtain 2000 watts, then operate in steady-state mode at 1625 watts. The same selection at 30°C (86°F) will start up the same, but operate at 1125 watts in a steady state mode.

Heat pumps are refrigeration machines. Refrigeration involves the removal of heat from a place where it is not wanted and depositing it in a place where it will be utilized. The heat can actually be deposited in a place where it will do some good. This is the difference between a heat pump and a summer air conditioner. The air conditioner can only pump heat one way. The heat pump is a refrigeration machine that can pump heat two ways.

The heat pump systems have eight major components:

- Condenser (front end heat exchanger)
- Compressor
- Orifice tube
- Evaporator (cabin heat exchanger)
- Reversing valve
- Heater Ventilation Air Conditioning Thermal Control Module (HTCM)
- Five-Way Valve Assembly
- Battery Thermal Module (BTM)

The heat exchangers either absorb or reject heat that has been absorbed into the vapor within the heat exchangers. The compressor pumps the heat-laden vapor through the system. The orifice tube is a metering device that controls the refrigerant flow. The reversing valve changes the direction of the refrigerant within the system to change from heating to cooling. The HTCM monitors cabin and ambient temperature, vapor temperature and pressure in the system, and adjusts the system performance versus power consumption to optimize driving range.

COOLING MODE

When the heat pump system is in the cooling mode, the refrigerant vapor going into the evaporator is cool. As the hot air passes through the evaporator, the refrigerant vapor absorbs the heat from inside the vehicle and the compressor moves the heat soaked vapor to the condenser. As the cooler outside air passes through the condenser, the air is warmed there by removing the heat from the refrigerant. The cooled refrigerant then returns to the cabin to start the cycle again.

When the heat pump system is in the cooling mode and the ambient temperature is less than or equal to 22.2°C (40°F), the heat pump system will not operate. Vent mode will be the only method of cooling the interior temperature available.

HEATING MODE

When the heat pump system is in the heating mode and the ambient temperature is less than, equal to, or greater than 22.2°C (40°F), the refrigerant vapor going into the evaporator is warm. As the cool cabin air passes through the evaporator it absorbs the cooled air from inside the vehicle and the compressor is moving the cooler soaked vapor to the condenser. As the outside air passes through the cold condenser the air is cooled removing the lower temperature from the refrigerant. The warm refrigerant then goes back to the cabin to start the cycle again.

When the heat pump system in is the heating mode and the ambient temperature is lower than 22.2°C (40°F), the heat pump compressor will not turn on. Heating during this temperature range will be accomplished using heat generated from the fuel-fired heater coolant system through the heater core.

During heating mode with the outside ambient temperature below 22.2°C (40°F), the HTCM monitors refrigerant temperature coming out of the condenser. If the refrigerant temperature gets too cold, the system will shut off. The reversing valve will move and the system will actually go into the cooling mode. This is called the passenger compartment exchanger mode. The cabin blower fan will turn off and remain off until the passenger compartment exchanger cycle is complete, which takes 3-5 minutes. This mode is necessary in order to keep the condenser from freezing during the heat mode. The heat pump system will do this automatically when the system senses the condenser is too cold to operate correctly in the heat mode. Once the heat pump system starts, the passenger compartment exchanger cycle cannot be turned off and will have to complete the 3-5 minute cycle time.

The heat pump system is controlled by a Heater Ventilation Air Conditioning Thermal Control Module (HTCM) that looks at the exterior ambient and the power level requested from the run/lock shift assembly controls. The HTCM will then command a certain amount of voltage to the compressor to maintain comfort in the vehicle and optimize driving range. For the first three minutes of the selected temperature range, the compressor will run at a higher voltage to get the cabin temperature cooler or warmer depending on the mode selected. Then the voltage will be commanded to a lower steady state to optimize driving range while maintaining comfort.

NOTICE: ***These air conditioning compressors are not repairable. Service is by replacement only.***

CONTROL ASSEMBLY

The control assembly in the instrument panel contains three controls: a switch to control blower speed, one rotary knob to select the desired operating mode, and a second rotary knob to control air temperature.

The controls are lit when the headlamps are on. Voltage is provided by the instrument panel lighting circuit. The control assembly lamp is in parallel with the instrument cluster bulbs, the radio dial bulb, and certain other interior illumination bulbs. Brightness of the dial illumination is controlled by the dimmer control of the headlamp switch.

Temperature Valve and Heater Core

The temperature of the air discharged from the heater system is regulated by controlling the relative amounts of warm and cool air that are mixed together downstream from the heater core area. The part of the total airflow that is allowed to pass through the heater core is governed by the position of the temperature valve.

Hot coolant from the fuel-fired heater's coolant system is directed through the heater core. The heater core transfers heat from the coolant to the air passing through the core fins.

Temperature Control

The temperature door is controlled by an electric motor that positions the door based on the temperature knob location.

When the temperature control is in the BLUE (cold) position, air delivered by the heater system is unheated. When the temperature control is in the RED (hot) position, all air passing through the heater module is heated before it is discharged. Intermediate positions of the temperature control result in a mixture of heated and unheated air to provide more moderate air temperatures.

As the temperature control rotates away from the BLUE (cold) position, the temperature valve moves away from the heater core to allow some air to flow through the heater core. The closer the temperature control is moved toward the RED (hot) position, the more the temperature valve turns away from the entrance to the heater core and the greater the airflow through the heater core. Heating a greater portion of the total airflow in this manner results in a warmer discharge of air from the outlets.

When the temperature control is in the full RED (hot) position, the temperature valve blocks off the passage that allows air to bypass the heater core and causes all of the airflow to go through the heater core for maximum heating. This method of temperature control provides a very rapid response to any change in temperature selection throughout the entire range when the fuel-fired heater is operating.

Mode Control

The mode control knob operates a rotary vacuum switch that routes vacuum to specific hoses in the vacuum harness. These hoses control vacuum actuators on the defroster duct. Each actuator operates an air valve (a door-like hinged deflector) that routes airflow to the various outlets of the heater/defrost system.

Although the control knob positions are shown as symbols on the face plate, the direction of air flow remains the same, they are: OFF, VENT, BI-LEV, HTR, BLEND, and DEFROST.

For additional information on mode operation, refer to Operating Modes in this section.

Mode Valves

After the heated and unheated airflows are mixed beyond the heater core, the combined airflow comes to the mode valves. These valves work in combination to control airflow through the passage that feeds the instrument panel outlets. For the VENT mode, vacuum is directed to the vacuum actuators and the mode valve(s) open to allow air to flow to the instrument panel outlet. In the HTR, and DEFROST modes, the vacuum actuators are vented and the mode valve(s) close to prevent airflow to the instrument panel outlets.

When the BI-LEV mode is selected, only the lower mode valve is opened. This divides the airflow so the instrument panel outlets, the floor air outlet(s), the defroster nozzles and the side window defogger outlets all receive a share of the air.

Another vacuum-controlled mode valve in the air distribution system is the defroster valve. In the HTR and BI-LEV modes, vacuum is applied to the defroster valve actuator. This moves the defroster valve to divert almost all of the airflow to the floor air outlet(s) to heat the passenger compartment. Only a slight amount passes through an opening in the defroster valve and goes to the windshield defroster nozzle.

In the DEFROST mode, the defroster valve actuator is vented to normal air pressure and the spring in the actuator holds the defroster valve in a position to route most of the airflow to the windshield defroster passage in the air distributor. In the VENT mode, the defroster valve also is held in this position. Only a slight amount of the total airflow passes through the opening in the defroster valve and goes to the floor air outlet(s).

Blower Speed Control

The blower switch provides a choice of various blower speeds. The blower switch receives power through a fuse in the fuse block when the ignition is ON. In the various speed positions, the circuit continues through the heater wiring harness to the blower motor resistor assembly near the blower motor.

From the resistor assembly, the circuit goes to the blower motor terminal to operate the blower motor.

The blower motor relay provides battery voltage to the blower motor assembly only during high blower motor assembly speed. The blower motor circuit is completed to ground by a wire in the heater wiring harness. This wire goes from the blower motor terminal to a terminal at the dash panel sheet metal near the blower assembly under the hood.

AIR DISTRIBUTION SYSTEM

Control of airflow through the HVAC module is regulated by vacuum-actuated doors. Outside air is either cooled or heated, then discharged according to control setting.

In case of vacuum hose leakage or collapse, it is not necessary to replace the entire vacuum hose assembly. Replacement can be made by cutting the hose and inserting a plastic connector. If an entire hose must be replaced, cut the hose off at the connector and then attach a new hose directly to the vacuum solenoid control assembly.

Vacuum System

Vacuum is supplied by a 12-volt pump that stores vacuum in a vacuum tank. The vacuum tank is mounted underneath the vehicle to the crossmember. The vacuum pump is controlled by a vacuum pressure sensor mounted externally to the tank. The vacuum sensor is a pressure sensitive sensor that monitors changes in Hg and opens or closes the contacts to turn on and off the vacuum pump.

All air valves, except the temperature valve, are controlled by vacuum stored in the vacuum tank. The vacuum tank is located under the vehicle, forward of the battery pack. The vacuum is routed by a vacuum switch in the control assembly to any of the spring-loaded two or three-position vacuum actuators. One vacuum actuator is linked to each air valve.

The vacuum switch in the control assembly is controlled by the mode control knob. For each mode control knob position, the vacuum switch directs vacuum to specific hoses and vents to normal air pressure the remaining hoses. When a hose vents to normal air pressure, the vacuum actuator's internal spring expands and holds the associated air valve in one position. When vacuum routes to the hose, the force of the vacuum overcomes the internal spring pressure and moves the air valve to the opposite extreme of its travel. In this way, the control knob positions the air valves for the selected operating mode.

Ducts and Outlets

A system of ducts and outlets directs air to the passenger compartment. In cases of poor air output, defroster, heater, air conditioning, and vent ducts should be checked for obstructions such as leaves, dirt, or objects that may have fallen into the ducts from the passenger compartment.

REFRIGERATION SYSTEM

Accumulator

The accumulator functions as a liquid/vapor separator that receives refrigerant vapor, some liquid refrigerant and refrigerant oil from the reversing valve. It only allows refrigerant vapor and oil to continue on to the compressor.

At the bottom of the accumulator is desiccant that acts as a drying agent for moisture that may have entered the heat pump system. An oil bleed hole is also located near the bottom of the accumulator outlet pipe to provide an oil return path to the compressor.

The accumulator is serviced only as a replacement assembly. Replace the accumulator whenever oil contamination is present.

Compressor

The compressor is a dual rolling-piston type pump, powered by a 180 voltage-variable speed three-phase alternating current induction brushless electric motor.

Compressor capacity is controlled by changing compressor speed from 25 Hz to 120 Hz.

The compressor displacement is 19 cc.

The compressor's main function is to compress the low-pressure refrigerant vapor from the accumulator into a high-pressure, high-temperature vapor.

All replacement compressors from service parts will have oil in the crankcase. The oil must be drained and retained. Replace the oil in the same amount as previously recorded from the old compressor.

Condenser

The header tube and center type condenser is made of cross tubes that carry the refrigerant, and cooling fins, which provide rapid transfer of heat. The air passing through the condenser cools the high-pressure refrigerant vapor causing it to condense into a liquid. The fins should be kept clean. Less than 20 percent of the fins should be bent or otherwise damaged.

Coolant Fan

The coolant fan is a 12-volt operated motor that provides air flow through the radiator and condenser. The fan is driven by an electric motor which is attached to the radiator shroud. The electric fan motor is controlled by the HTCM based on coolant temperature and A/C request. The voltage to the electric fan motor is pulse width modulated to reduce current surge and increase motor life.

Reversing Valve and Primary Valve Assembly

The reversing valve and primary valve assemblies are an integrated assembly controlled by electric solenoids. The reversing valve assembly reverses the refrigerant flow through the evaporator and condenser by means of a sliding port assembly, thereby exchanging the functions of the condenser and evaporator for heating and cooling modes depending on the command.

The reversing valve assembly is controlled by the HTCM. The HTCM will supply battery voltage to the reversing valve assembly solenoid depending on the command. This in turn will open or close the valve depending if heat or cooling is required. As a result the refrigerant compressor will supply high-pressure gas (for heating) or low-pressure gas (for cooling) to the appropriate evaporators.

The primary valve switches the refrigerant flow from the passenger compartment to BTM for heating or cooling the batteries and work in conjunction with the secondary valve assembly.

The primary valve assembly is a refrigerant flow control valve controlled by an electric solenoid and relay. When commanded by the HTCM, the body control interface module sends a ground signal to the primary battery valve relay assembly to complete the circuit. This in turn forces the valve to open and allow refrigerant to flow through the battery pack blower assembly. The secondary valve assembly isolates and separates the refrigerant flow between the passenger evaporator core and the BTM.

Secondary Valve Assembly

The secondary valve assembly is a refrigerant flow control valve controlled by an electric solenoid and relay. When commanded by the HTCM, the body control interface module sends a ground signal to the secondary battery valve relay assembly to complete the circuit. This in turn forces the valve to open and allow refrigerant to flow through the BTM. The secondary valve assembly isolates and separates the refrigerant flow between the passenger evaporator core and the BTM.

Primary and Secondary Valve Function Matrix

Valve	Valve	Position
Primary Valve ON	Secondary Valve OFF	Passenger Evaporator
Primary Valve OFF	Secondary Valve ON	BTM

NOTICE: ***The primary valve and secondary valves must work inversely opposite of each other. Failure to do so will result in damage to the system.***

Expansion Orifice Tube

The plastic expansion tube contains a fixed diameter tube with a mesh filter screen at either end. It is located in the evaporator inlet pipe, which is located under the auxiliary 12-volt battery. It creates a restriction to the high-pressure liquid refrigerant in the liquid line, metering the flow of refrigerant to the evaporator as a low-pressure liquid. When the vehicle is turned OFF with the air conditioning operating, the refrigerant in the system will flow from the high-pressure side of the expansion tube (orifice) to the low-pressure side until the pressure is equalized. This may be detected as a faint sound of liquid flowing (hissing) for 30 to 60 seconds. This is a normal condition.

When system diagnostics indicate a restricted expansion tube, it may not be necessary to replace it. Metal chips, flakes, or slivers found on the screen may be removed with compressed air. The expansion tube may be reused if:

- The plastic frame is not broken.
- The expansion tube is not damaged or plugged.
- The screen material is not torn.
- The screen is not plugged with fine gritty material.

Reversing Valve Assembly

The reversing valve assembly reverses refrigerant flow path through the evaporator and condenser through a sliding port assembly. This results in switching of the condenser and evaporator for heating and cooling modes. There are three main components of the reversing valve assembly. A pilot valve, a solenoid valve acted by 12-volts, and controlled by the Heater Ventilation Air Conditioning Thermal Control Module (HTCM) and the main valve.

This vehicle uses two evaporators. One is located under the hood inside the evaporator housing and is for the passenger compartment. The second is located underneath the vehicle just in front of the battery pack. This evaporator is housed inside the battery thermal housing and is for cooling and heating of the battery pack. This system is similar to an auxiliary A/C cooling system. The evaporator cools, heats, and dehumidifies the air before it enters the vehicle. In the cooling mode, high-pressure liquid refrigerant flows through the orifice tube into the low-pressure area of the evaporator. The heat in the air passing through the evaporator core is lost to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water. During the heat mode high-pressure liquid is forced through the evaporator, from here the heat is dissipated across the core tubes and fins.

Heater Core

In any air conditioning mode, the heater core heats the cool dehumidified air to achieve the desired air temperature. The position of the control assembly temperature knob determines how much heat is added to the incoming air.

Refrigerant-134a

CAUTION: Avoid breathing A/C Refrigerant-134a and lubricant vapor mist. Exposure may irritate eyes, nose, and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements for SAE J 2210 (R-134a recycling equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

Like the coolant in the powertrain cooling system, the refrigerant is the substance in the air conditioning system that absorbs, carries, and then releases heat. Although various substances are used as refrigerants in other types of refrigeration systems, past automotive air conditioning systems used a type called Refrigerant-12 (R-12).

This vehicle uses a refrigerant called Refrigerant-134a (R-134a). It is a non-toxic, non-flammable, clear, colorless, liquefied gas.

While the R-134a A/C system is very similar to an R-12 A/C system, the differences in the refrigerant, lubricants, and service equipment are important.

NOTICE: ***R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. R-12 in a R-134a system will cause compressor failure, refrigerant oil sludge, or poor air conditioning system performance.***

Refrigerant-134a carries a charge of a special lubricant, Electric Vehicle Ester refrigerant oil. GM refrigerant oil will have a slight blue tint. The oil is hydroscopic (absorbs water from the atmosphere). Store the oil in a closed container.

VENTILATION

The air distribution system provides fresh air ventilation for the passenger compartment in all operating modes. After being warmed to the desired temperature, the air is discharged from the outlets appropriate to the selected operating mode. When all the windows are closed, the addition of outside air builds a slight positive pressure within the passenger compartment. The pressure forces stale air to leave the vehicle through a pressure relief valve below the window in the rear of the cab after it has circulated through the passenger compartment.

HEATER SYSTEM

This vehicle uses two systems for cabin heating. The systems are temperature dependent for operation. If the ambient air temperatures are above 22.2°C (40°F), the heat pump system will be used. If the ambient air temperature is below 22.2°C (40°F), degrees a remote diesel fuel heater will heat coolant for the heater core. The first system uses the air conditioning system in the heat pump mode. From here high-pressure gas is passed across the evaporator which produces heat for the cabin (refer to system operation in the above text). The second system uses a remote diesel fuel heater that heats the coolant within the heater assembly. From here the heated coolant is forced through the heater core dissipating heat as air is forced through (for additional information refer to Heating Mode in this section).

The dehumidified air is reheated as it passes through the heater core in the heater module. The heater is warmed by heater coolant passing through the tubes of the heater core. This heat is transferred to the heater core fins and given off to the air flowing past the fins. The position of the air temperature air valve in the air conditioning module determines how much of the total airflow is allowed to pass through the heater. In turn, this determines the warmth of the total airflow discharged into the passenger compartment.

DIAGNOSIS

FUEL-FIRED HEATER DIAGNOSIS

Step	Action	Value(s)	Yes	No
1	1. Install scan tool and check for DTC(s). Are any DTC(s) set?	—	Go to *Appropriate DTC(s)*	Go to *Step 2*
2	1. Install fuse jumper at fuel-fired heater services port. Refer to component location in Electrical. 2. Turn the ignition switch to the ON position. 3. Activate the heater switch. Does the ON indicator lamp illuminate?	—	Go to *Step 3*	Go to *Step 4*
3	1. Install scan tool. 2. From the HTCM menu, select heat command. Is the heat command state on?	—	Go to *Step 4*	Go to *Step 5*
4	Check for operation of the fuel-fired heater. Is the fuel-fired heater operating?	—	System normal refer to *Intermittent Diagnostic Aids*	Go to *Step 5*
5	Check Gauge fuse 4, Ctsy fuse 2 and BPM/PCM fuse 9. Was fuse(s) open?	—	Go to *Step 6*	Go to *Step 7*
6	Replace fuse and determine cause of overload. Was fuse(s) replaced?	—	Go to *Step 15*	Go to *Step 7*
7	Back probe terminal B6 ckt 1397 of the BCIM. Is voltage within specification?	above 10 volts	Go to *Step 9*	Go to *Step 8*
8	Check for voltage at terminal A of the heater switch. Is voltage present?	—	Go to *Step 9*	Replace the Heater Switch. Refer To Heater Switch Replacement in this section.
9	Back probe terminal C4 ckt 910 of the HTCM. Is voltage within specification?	above 10 volts	Go to *Step 10*	Go to *Step 11*
10	Check for voltage at terminal B of the heater switch. Is voltage present?	—	Go to *Step 11*	Replace the Heater Switch. Refer to Heater Switch Replacement in this section.
11	Check for voltage at terminal D2 ckt 924 of the BCIM. Is voltage present?	—	Go to *Step 12*	Replace BCIM

Step	Action	Value(s)	Yes	No
12	Check for continuity from ground to terminal E ckt 50 of the fuel fire heater. Is continuity present?	—	Go to *Step 14*	Go to *Step 13*
13	Locate and repair open in ground from terminal E ckt 50 and ground. Was a repair made?	—	Go to *Step 15*	Go to *Step 14*
14	Check for voltage at terminal C ckt 925 of the fuel-fired heater. Is voltage present?	—	Replace fuel-fired heater	Go to *Step 15*
15	Locate and repair open in ckt 925 of the fuel-fired heater.	—	Go to *Step 15*	—
16	Clear DTC(s).	—	—	—

FUNCTION TEST

Before beginning the functional test of the heater system, the fuel-fired heating system must be stabilized with the coolant hot. Coolant temperature must be about 90°C (194°F). During the function test, evaluate the operating efforts of the mode control knob and the temperature control knob. Even if a problem is found during any intermediate step of the function test, the test should be completed before repair is started (Figures 1 and 2).

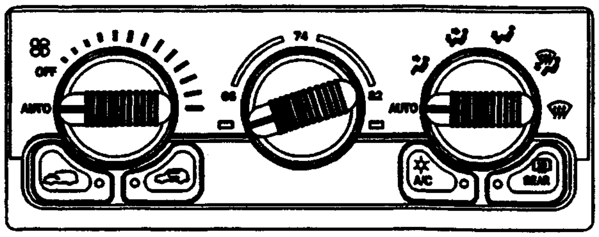
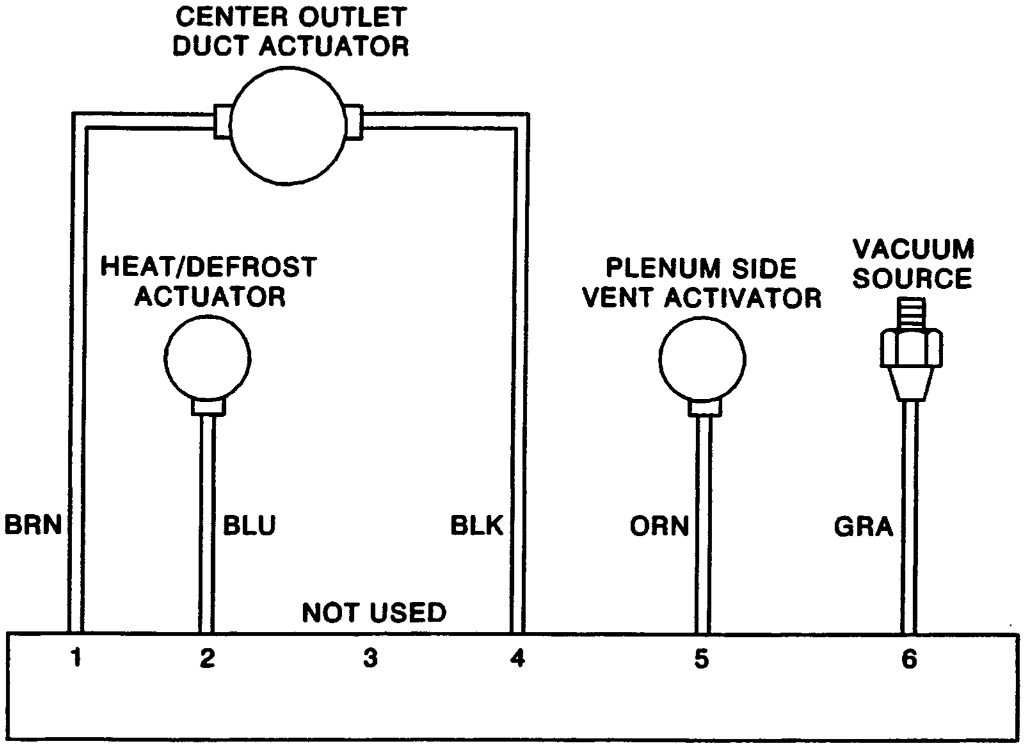


Figure 1—Heater Control Assembly


CENTER OUTLET
DUCT ACTUATOR
HEAT/DEFROST
ACTUATOR
PLENUM SIDE
VENT ACTIVATOR
VACUUM
SOURCE
BRN
BLU
BLK
ORN
GRA
NOT USED
1
2
3
4
5
6

A/C – HEATER VACUUM SELECTOR VALVE OPERATING CHART

CONNECTION	PORT	OFF	MAX	NORM	BI–LEV	VENT	HTR	BLEND	DEF
DEFROST	1	VENT	VAC	VAC	VENT	VAC	VENT	VENT	VAC
A/C	2	VENT	VAC	VAC	VAC	VAC	VENT	VENT	VENT
NOT USED	3	VENT	VENT	VENT	VENT	VENT	VENT	VENT	VENT
HEAT	4	VAC	VENT	VENT	VENT	VENT	VAC	VENT	VENT
RECIRC	5	VENT	VAC	VENT	VENT	VENT	VENT	VENT	VENT
SOURCE	6	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC

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Figure 2—Vacuum Schematic

HEATER FUNCTION TEST

STEP	CONTROL SETTINGS			SYSTEM RESPONSE				
	Mode Control	Temperature Control	Fan Switch	Blower Speed	Heater Outlets	A/C Outlets	Defroster Outlets	See Remarks
1	OFF	COLD (BLUE)	LOW TO HI	OFF	NO AIR FLOW	NO AIR FLOW	NO AIR FLOW	
2	VENT	COLD	HI	HI	NO AIR FLOW	AIR FLOW	NO AIR FLOW	A,C
3	BI-LEV	COLD	HI	HI	AIR FLOW	AIR FLOW	NO AIR FLOW	A,B,C
4	HTR	HOT (RED)	HI	HI	AIR FLOW	NO AIR FLOW	MIN AIR FLOW	A,B,C
5	BLEND	HOT	HI	HI	AIR FLOW	NO AIR FLOW	AIR FLOW	A,B,C
6	DEF	HOT	HI	HI	MIN AIR FLOW	NO AIR FLOW	AIR FLOW	A,B,C

REMARKS
A. NOTICEABLE BLOWER SPEED INCREASE MUST OCCUR FROM LOW THRU HI
B. ENGAGEMENT OF DETENT MUST BE FELT IN EACH MODE.
C. CHECK FOR AIR AT SIDE WINDOW DEFOG OUTLETS.

T3212

HEATER OUTPUT TEMPERATURE CHECK

Check the heat output of the heater system with the following procedure.

Preparation

Install fuse jumper in fuel-fired heater jumper connector. Refer to Electrical for connector location. With the fuel-fired heater system sufficiently cool, remove the fuel-fired heater coolant system cap, start the system, and allow the system to stabilize. Set the heater controls to HTR mode, full RED (hot) temperature Heater switch on, and HI blower speed. When coolant flow in the fuel-fired heater coolant system is visible through the filler neck, install the fuel-fired heater coolant system cap.

Temperature Check

Allow the fuel-fired heater system to warm up (after approximately 2 minutes of operation. Use an accurate thermometer to determine the outside air temperature and the temperature of the air discharged at the floor outlets with the vehicle being operated for approximately 3-5 minutes. Minimum acceptable heater output temperatures at four different outside air temperatures are shown in the following table.

Outside Air Temperature	-18°C (0°F)	-4°C (25°F)	10°C (50°F)	24°C (75°F)
Heater Air Temperature	54°C (130°F)	59°C (139°F)	64°C (147°F)	68°C (155°F)
				T2550

Minimum acceptable heater output temperatures for outside air temperatures other than those shown, can be approximated by using the Fahrenheit scale and rounding off the outside air temperature to the nearest 5 degrees. For every additional 5 degrees of outside temperature, an additional 1.8 degrees of heater output temperature should be allowed when the outside temperature is below 50 degrees. An additional 1.6 degrees of heater output temperature should be allowed for every 5 degrees of outside temperature when the outside temperature is above 50 degrees.

INSUFFICIENT HEATING OR DEFROSTING

The most likely causes of insufficient heating outside the heater system include a low coolant level, faulty fuel-fired heater system, partially or fully clogged heater core or hose, obstruction to air circulation, or an air leak past a faulty seal into the passenger compartment. For an organized diagnosis procedure, refer to Figures 3 and 4.

IMPROPER AIR DELIVERY

For diagnosis procedure of improper air delivery, refer to Figure 5.

BLOWER NOISE

A constant air rush noise is typical of all heater systems when operating on HI blower. Some systems and modes may be louder than others. If possible, check a similar vehicle to determine whether the noise is typical or excessive. For diagnosis of excessive blower noise, refer to Figures 6 and 7.

EXCESSIVE HEAT

The most likely cause of excessive heat from the heater system is a bad temperature actuator. Other related causes of excessive heat include a faulty mode selector (control assembly), or an open or shorted electrical harness.

RELAYS AND SENSORS

Blower Motor Relay

The blower motor relay directs battery voltage to the blower motor assembly only during high blower speed. The blower motor resistor directs power to the blower motor assembly in all other speed settings.

Fuel-Fired Heater Relay

The fuel-fired heater relay directs battery voltage to the fuel-fired heater assembly when the command is sent by the Body Control Interface Module (BCIM). When the heater switch is depressed, and the conditions for activation of the fuel-fired heater are met the BCIM will supply a ground for the relay. This in turn will supply voltage to the fuel-fired heater assembly.

High-Pressure Sensor

The system is also equipped with a high-pressure sensor. The sensor is located in the discharge side of the compressor (high-side). This switch is a pressure transducer and sends a 0 to 5-volt signal to the HTCM. The HTCM uses this signal to monitor the pressure in the system. The compressor in turn will use this signal to vary the compressor speed according to the command from the HTCM.

Low-Pressure Sensor

The system is also equipped with a low-pressure sensor. The sensor is located in the suction side of the compressor (low-side). This switch is a pressure transducer and sends a 0 to 5-volt signal to the HTCM. The HTCM uses this signal to monitor the pressure in the system. The compressor in turn will use this signal to vary the compressor speed according to the command from the HTCM.

Additional compressor protection results from the operating characteristics of the system as monitored and controlled by the HTCM. If a massive discharge occurs in the low-side of the system, or the orifice tube becomes plugged, low-side pressures could be insufficient to command the air compressor on.

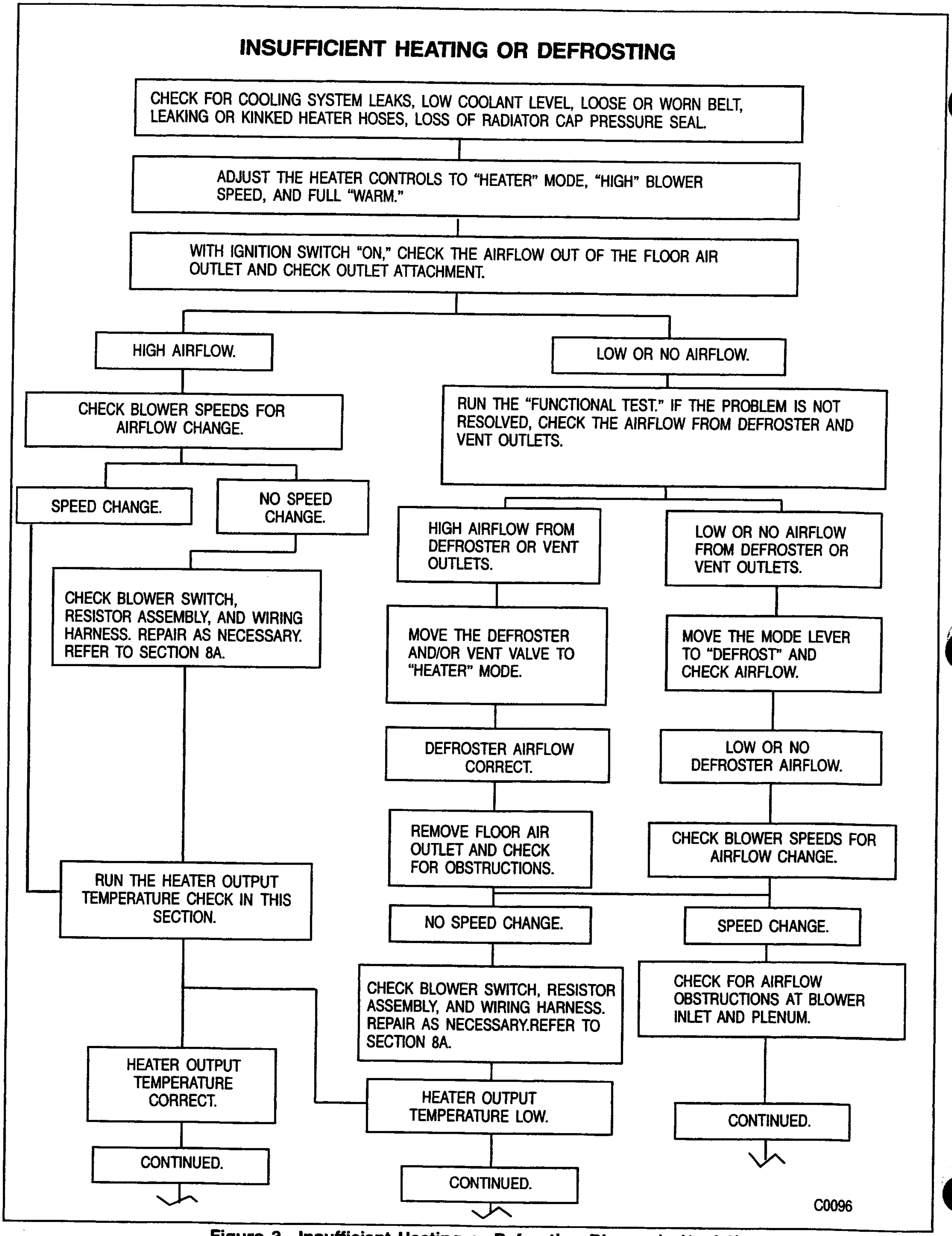

INSUFFICIENT HEATING OR DEFROSTING
CHECK FOR COOLING SYSTEM LEAKS, LOW COOLANT LEVEL, LOOSE OR WORN BELT, LEAKING OR KINKED HEATER HOSES, LOSS OF RADIATOR CAP PRESSURE SEAL.
ADJUST THE HEATER CONTROLS TO "HEATER" MODE, "HIGH" BLOWER SPEED, AND FULL "WARM."
WITH IGNITION SWITCH "ON," CHECK THE AIRFLOW OUT OF THE FLOOR AIR OUTLET AND CHECK OUTLET ATTACHMENT.
HIGH AIRFLOW.
CHECK BLOWER SPEEDS FOR AIRFLOW CHANGE.
SPEED CHANGE.
NO SPEED CHANGE.
CHECK BLOWER SWITCH, RESISTOR ASSEMBLY, AND WIRING HARNESS. REPAIR AS NECESSARY. REFER TO SECTION 8A.
RUN THE HEATER OUTPUT TEMPERATURE CHECK IN THIS SECTION.
HEATER OUTPUT TEMPERATURE CORRECT.
CONTINUED.
LOW OR NO AIRFLOW.
RUN THE "FUNCTIONAL TEST." IF THE PROBLEM IS NOT RESOLVED, CHECK THE AIRFLOW FROM DEFROSTER AND VENT OUTLETS.
HIGH AIRFLOW FROM DEFROSTER OR VENT OUTLETS.
MOVE THE DEFROSTER AND/OR VENT VALVE TO "HEATER" MODE.
DEFROSTER AIRFLOW CORRECT.
REMOVE FLOOR AIR OUTLET AND CHECK FOR OBSTRUCTIONS.
NO SPEED CHANGE.
CHECK BLOWER SWITCH, RESISTOR ASSEMBLY, AND WIRING HARNESS. REPAIR AS NECESSARY.REFER TO SECTION 8A.
HEATER OUTPUT TEMPERATURE LOW.
CONTINUED.
LOW OR NO AIRFLOW FROM DEFROSTER OR VENT OUTLETS.
MOVE THE MODE LEVER TO "DEFROST" AND CHECK AIRFLOW.
LOW OR NO DEFROSTER AIRFLOW.
CHECK BLOWER SPEEDS FOR AIRFLOW CHANGE.
SPEED CHANGE.
CHECK FOR AIRFLOW OBSTRUCTIONS AT BLOWER INLET AND PLENUM.
CONTINUED.
C0096

Figure 3—Insufficient Heating or Defrosting Diagnosis (1 of 2)

INSUFFICIENT HEATING OR DEFROSTING
(Continued)

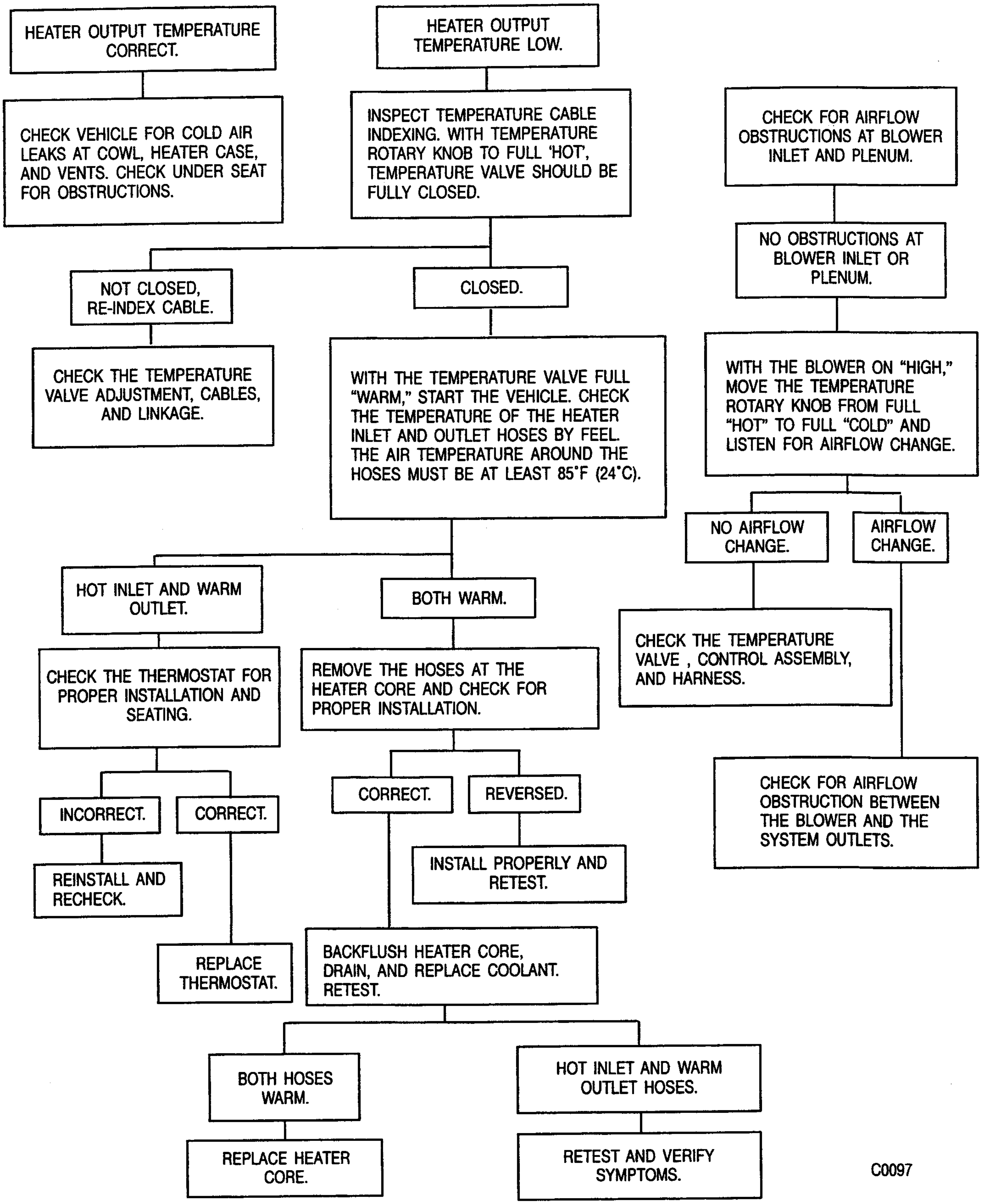

HEATER OUTPUT TEMPERATURE CORRECT.
CHECK VEHICLE FOR COLD AIR LEAKS AT COWL, HEATER CASE, AND VENTS. CHECK UNDER SEAT FOR OBSTRUCTIONS.
HEATER OUTPUT TEMPERATURE LOW.
INSPECT TEMPERATURE CABLE INDEXING. WITH TEMPERATURE ROTARY KNOB TO FULL 'HOT', TEMPERATURE VALVE SHOULD BE FULLY CLOSED.
NOT CLOSED, RE-INDEX CABLE.
CHECK THE TEMPERATURE VALVE ADJUSTMENT, CABLES, AND LINKAGE.
CLOSED.
WITH THE TEMPERATURE VALVE FULL "WARM," START THE VEHICLE. CHECK THE TEMPERATURE OF THE HEATER INLET AND OUTLET HOSES BY FEEL. THE AIR TEMPERATURE AROUND THE HOSES MUST BE AT LEAST 85°F (24°C).
HOT INLET AND WARM OUTLET.
CHECK THE THERMOSTAT FOR PROPER INSTALLATION AND SEATING.
INCORRECT.
REINSTALL AND RECHECK.
CORRECT.
REPLACE THERMOSTAT.
BOTH WARM.
REMOVE THE HOSES AT THE HEATER CORE AND CHECK FOR PROPER INSTALLATION.
CORRECT.
REVERSED.
INSTALL PROPERLY AND RETEST.
BACKFLUSH HEATER CORE, DRAIN, AND REPLACE COOLANT. RETEST.
BOTH HOSES WARM.
REPLACE HEATER CORE.
HOT INLET AND WARM OUTLET HOSES.
RETEST AND VERIFY SYMPTOMS.
CHECK FOR AIRFLOW OBSTRUCTIONS AT BLOWER INLET AND PLENUM.
NO OBSTRUCTIONS AT BLOWER INLET OR PLENUM.
WITH THE BLOWER ON "HIGH," MOVE THE TEMPERATURE ROTARY KNOB FROM FULL "HOT" TO FULL "COLD" AND LISTEN FOR AIRFLOW CHANGE.
NO AIRFLOW CHANGE.
CHECK THE TEMPERATURE VALVE , CONTROL ASSEMBLY, AND HARNESS.
AIRFLOW CHANGE.
CHECK FOR AIRFLOW OBSTRUCTION BETWEEN THE BLOWER AND THE SYSTEM OUTLETS.
C0097

Figure 4—Insufficient Heating or Defrosting Diagnosis (2 of 2)

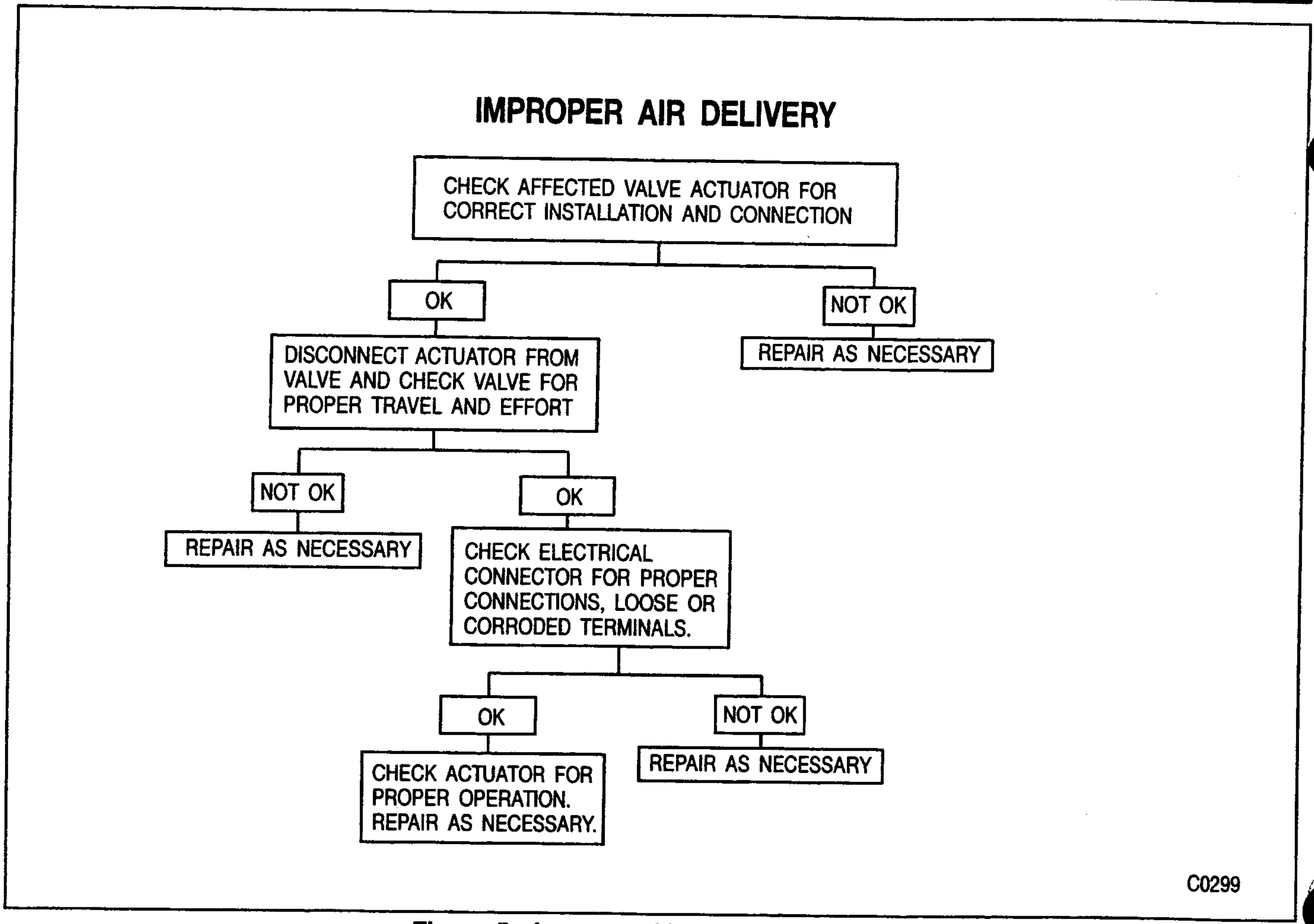

IMPROPER AIR DELIVERY
CHECK AFFECTED VALVE ACTUATOR FOR CORRECT INSTALLATION AND CONNECTION
OK
NOT OK
DISCONNECT ACTUATOR FROM VALVE AND CHECK VALVE FOR PROPER TRAVEL AND EFFORT
REPAIR AS NECESSARY
NOT OK
OK
REPAIR AS NECESSARY
CHECK ELECTRICAL CONNECTOR FOR PROPER CONNECTIONS, LOOSE OR CORRODED TERMINALS.
OK
NOT OK
CHECK ACTUATOR FOR PROPER OPERATION. REPAIR AS NECESSARY.
REPAIR AS NECESSARY
C0299

Figure 5—Improper Air Delivery Diagnosis

REFRIGERANT SYSTEM DIAGNOSIS

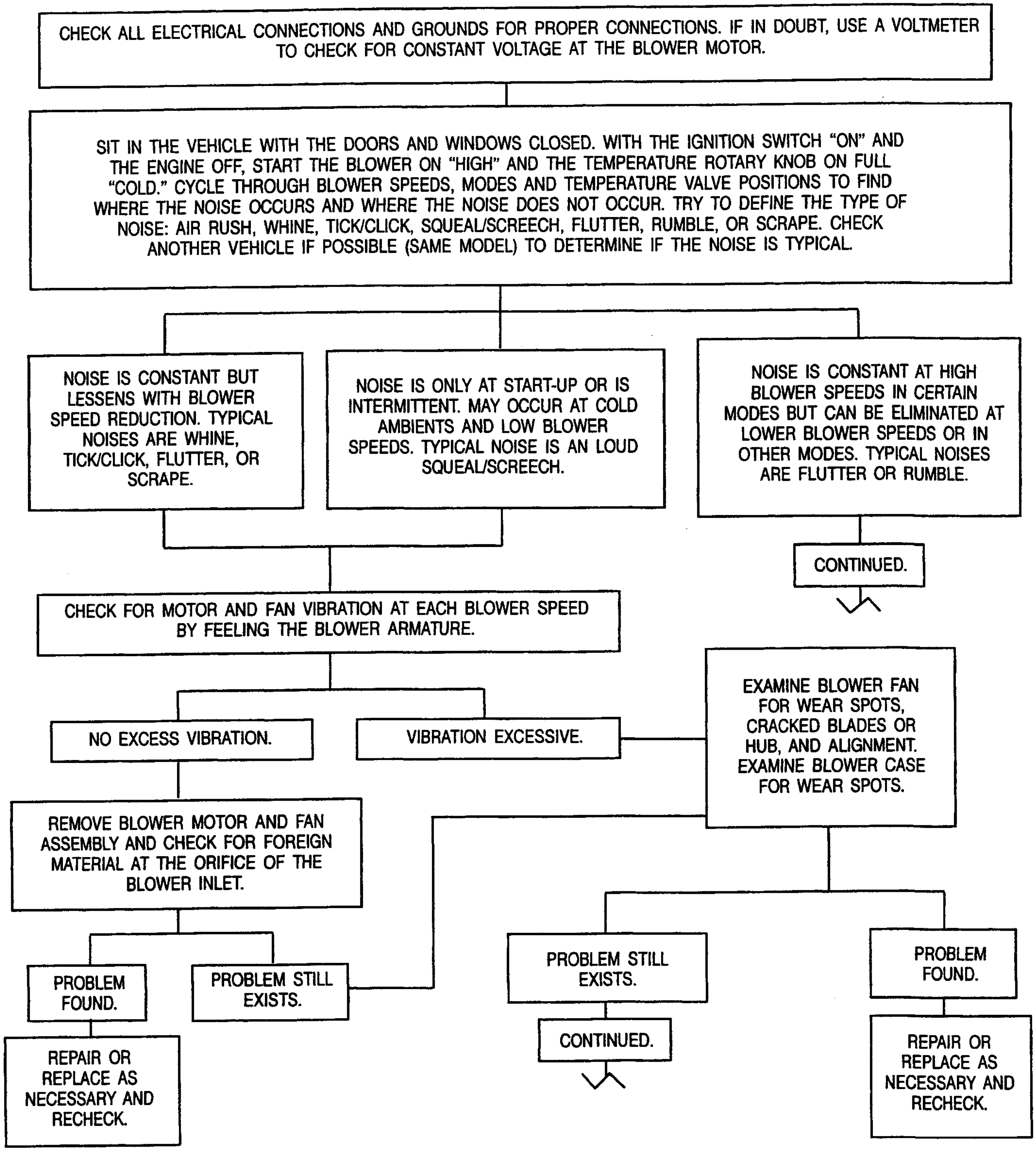
REFRIGERANT SYSTEM CHECKS

Functional Test

To aid in determining whether or not the electrical, vacuum, and refrigeration systems are operating properly, refer to the following:

1. Operation of the air conditioning modes and blower at all speeds with the mode lever in any position except OFF and engagement of the compressor would indicate that the electrical circuits are operating properly.
2. The same hand felt temperature of the evaporator inlet pipe and the accumulator surface of an operating system would indicate a properly charged system.

BLOWER NOISE



CHECK ALL ELECTRICAL CONNECTIONS AND GROUNDS FOR PROPER CONNECTIONS. IF IN DOUBT, USE A VOLTMETER TO CHECK FOR CONSTANT VOLTAGE AT THE BLOWER MOTOR.

SIT IN THE VEHICLE WITH THE DOORS AND WINDOWS CLOSED. WITH THE IGNITION SWITCH "ON" AND THE ENGINE OFF, START THE BLOWER ON "HIGH" AND THE TEMPERATURE ROTARY KNOB ON FULL "COLD." CYCLE THROUGH BLOWER SPEEDS, MODES AND TEMPERATURE VALVE POSITIONS TO FIND WHERE THE NOISE OCCURS AND WHERE THE NOISE DOES NOT OCCUR. TRY TO DEFINE THE TYPE OF NOISE: AIR RUSH, WHINE, TICK/CLICK, SQUEAL/SCREECH, FLUTTER, RUMBLE, OR SCRAPE. CHECK ANOTHER VEHICLE IF POSSIBLE (SAME MODEL) TO DETERMINE IF THE NOISE IS TYPICAL.

NOISE IS CONSTANT BUT LESSENS WITH BLOWER SPEED REDUCTION. TYPICAL NOISES ARE WHINE, TICK/CLICK, FLUTTER, OR SCRAPE.

NOISE IS ONLY AT START-UP OR IS INTERMITTENT. MAY OCCUR AT COLD AMBIENTS AND LOW BLOWER SPEEDS. TYPICAL NOISE IS AN LOUD SQUEAL/SCREECH.

NOISE IS CONSTANT AT HIGH BLOWER SPEEDS IN CERTAIN MODES BUT CAN BE ELIMINATED AT LOWER BLOWER SPEEDS OR IN OTHER MODES. TYPICAL NOISES ARE FLUTTER OR RUMBLE.

CONTINUED.

CHECK FOR MOTOR AND FAN VIBRATION AT EACH BLOWER SPEED BY FEELING THE BLOWER ARMATURE.

NO EXCESS VIBRATION.

VIBRATION EXCESSIVE.

EXAMINE BLOWER FAN FOR WEAR SPOTS, CRACKED BLADES OR HUB, AND ALIGNMENT. EXAMINE BLOWER CASE FOR WEAR SPOTS.

REMOVE BLOWER MOTOR AND FAN ASSEMBLY AND CHECK FOR FOREIGN MATERIAL AT THE ORIFICE OF THE BLOWER INLET.

PROBLEM FOUND.

PROBLEM STILL EXISTS.

REPAIR OR REPLACE AS NECESSARY AND RECHECK.

PROBLEM STILL EXISTS.

CONTINUED.

PROBLEM FOUND.

REPAIR OR REPLACE AS NECESSARY AND RECHECK.

C0099

Figure 6—Blower Noise Diagnosis Procedure (1 of 2)

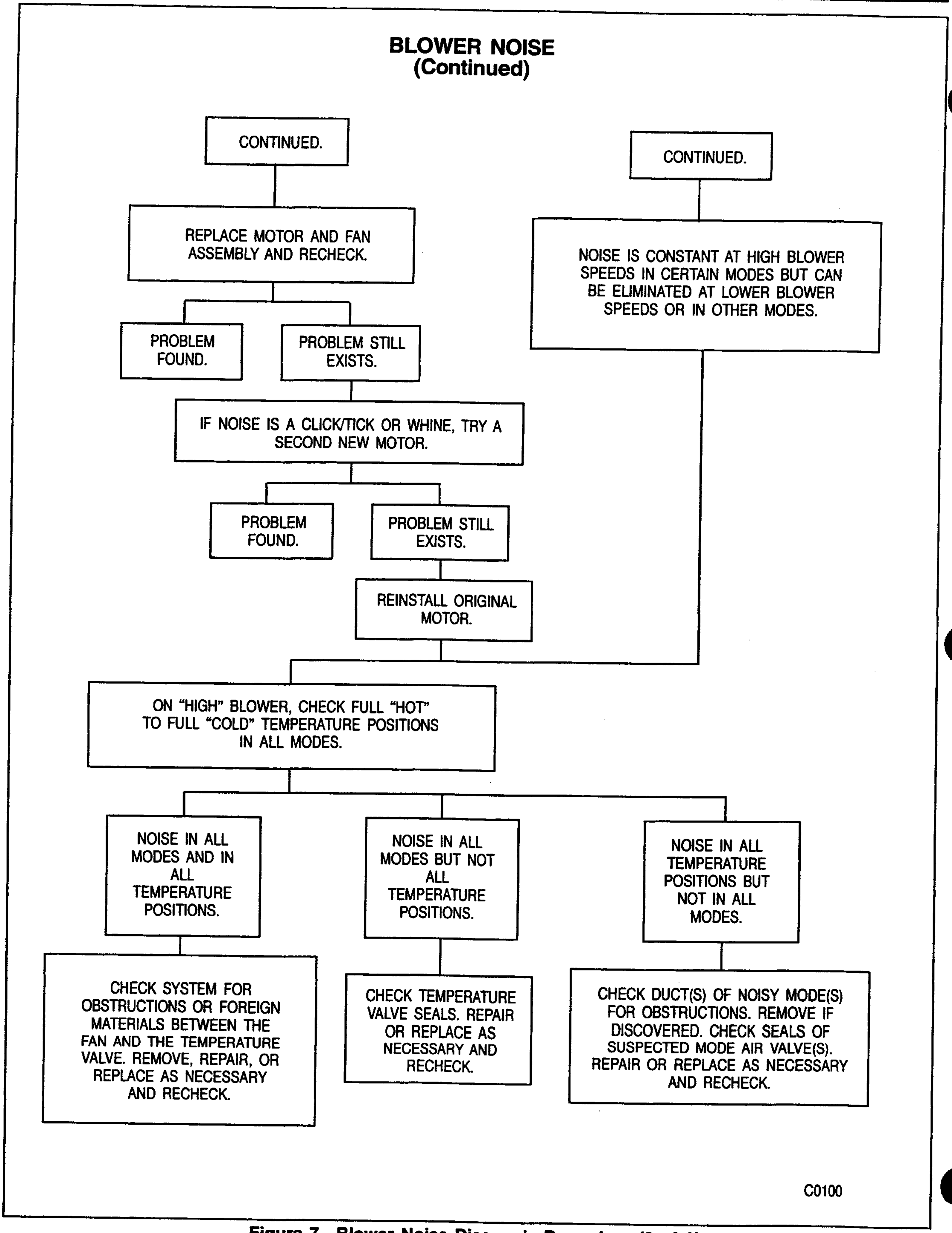

BLOWER NOISE
(Continued)
CONTINUED.
REPLACE MOTOR AND FAN ASSEMBLY AND RECHECK.
PROBLEM FOUND.
PROBLEM STILL EXISTS.
IF NOISE IS A CLICK/TICK OR WHINE, TRY A SECOND NEW MOTOR.
PROBLEM FOUND.
PROBLEM STILL EXISTS.
REINSTALL ORIGINAL MOTOR.
CONTINUED.
NOISE IS CONSTANT AT HIGH BLOWER SPEEDS IN CERTAIN MODES BUT CAN BE ELIMINATED AT LOWER BLOWER SPEEDS OR IN OTHER MODES.
ON "HIGH" BLOWER, CHECK FULL "HOT" TO FULL "COLD" TEMPERATURE POSITIONS IN ALL MODES.
NOISE IN ALL MODES AND IN ALL TEMPERATURE POSITIONS.
NOISE IN ALL MODES BUT NOT ALL TEMPERATURE POSITIONS.
NOISE IN ALL TEMPERATURE POSITIONS BUT NOT IN ALL MODES.
CHECK SYSTEM FOR OBSTRUCTIONS OR FOREIGN MATERIALS BETWEEN THE FAN AND THE TEMPERATURE VALVE. REMOVE, REPAIR, OR REPLACE AS NECESSARY AND RECHECK.
CHECK TEMPERATURE VALVE SEALS. REPAIR OR REPLACE AS NECESSARY AND RECHECK.
CHECK DUCT(S) OF NOISY MODE(S) FOR OBSTRUCTIONS. REMOVE IF DISCOVERED. CHECK SEALS OF SUSPECTED MODE AIR VALVE(S). REPAIR OR REPLACE AS NECESSARY AND RECHECK.
C0100

Figure 7—Blower Noise Diagnosis Procedure (2 of 2)

Performance Test

Tool Required:
J 21213-A Four Jack-Dual Range Temperature Tester or Equivalent

1. Park vehicle inside or in a shaded area.
2. Open doors or windows to ventilate interior.
3. Open the hood and install high and low-side pressure gauges. Route the lines over the rear hood seal, and tape the gauges to the windshield for viewing.
4. Close the hood to the safety latch position.
5. Record the ambient temperature at the vehicle.
6. Record relative humidity. Consult your local weather bureau.

Important

- Be sure to record relative humidity and ambient temperature conditions at time of test.

7. Close doors or windows.
8. Set mode control to MAX A/C, adjust blower speed to HI, and temperature to full cold.
9. Open air conditioning outlets.
10. Install J 21213-A or equivalent into the right-center air conditioning outlet.
11. Place vehicle in PARK.
12. Start system, stabilize system, and start the timer.

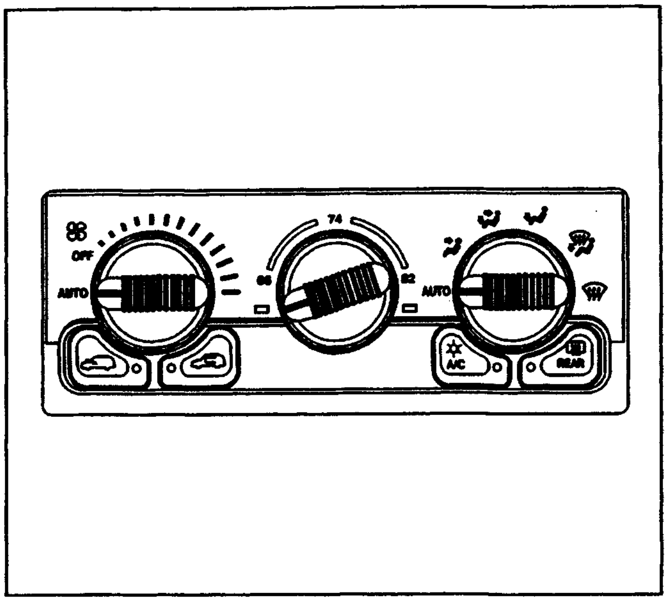


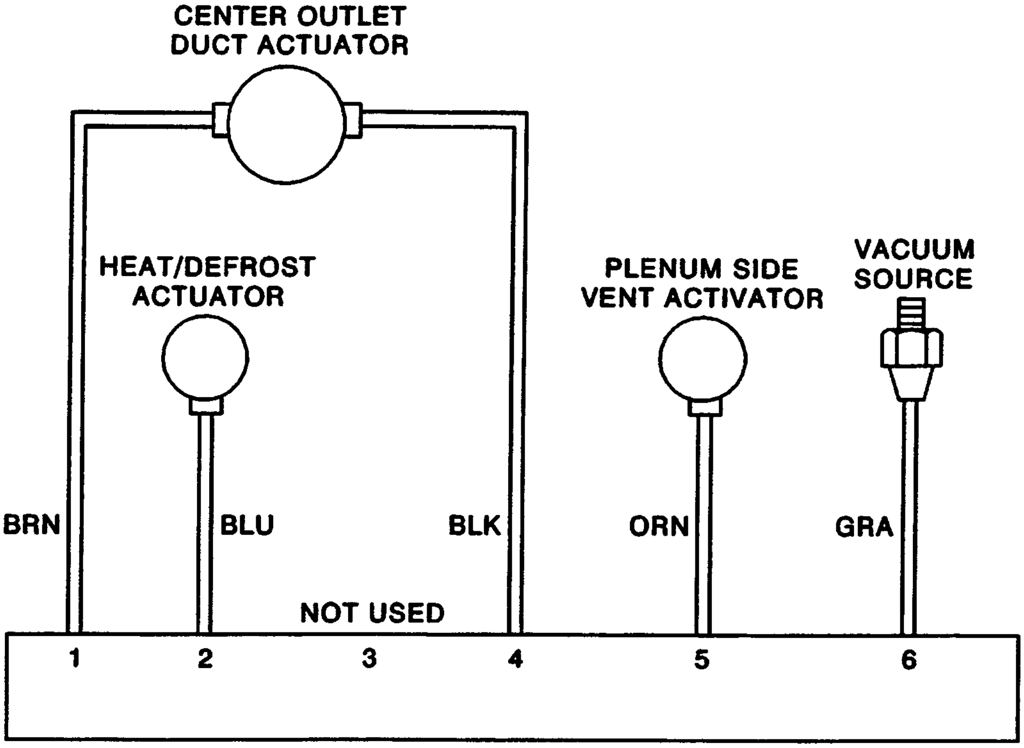
Figure 8—Control Assembly

13. Run the air conditioning system until outlet air reaches the lowest temperature (about 3 minutes).
14. Record outlet air temperature and high-side and low-side pressures.
15. Turn the system off and compare the readings. Normallyoperating air conditioning systems should not exceed the levels shown in (Figures 9 and 10).

PSIG	TEMP (°F) R-134A	PSIG	TEMP (°F) R-134A	PSIG	TEMP (°F) R-134A	PSIG	TEMP (°F) R-134A
0	-14.7	25	29.3	70	69.6	200	130.1
1	-12.1	26	30.5	75	72.9	210	133.5
2	-9.6	27	31.7	80	76.1	220	136.7
3	-7.2	28	32.9	85	79.2	230	139.8
4	-4.9	29	34.0	90	82.2	240	142.9
5	-2.7	30	35.1	95	85.0	250	145.9
6	-0.6	32	37.4	100	87.8	260	148.8
7	1.4	34	39.5	105	90.5	270	151.6
8	3.4	36	41.6	110	93.1	280	154.3
9	5.3	38	43.6	115	95.6	290	157.0
10	7.1	40	45.6	120	98.0	300	159.6
11	8.9	42	47.4	125	100.4	310	162.2
12	10.6	44	49.2	130	102.7	320	164.7
13	12.3	46	51.0	135	104.9	330	167.2
14	13.9	48	52.8	140	107.1	340	169.6
15	15.4	50	54.5	145	109.3	350	171.9
16	17.0	52	56.4	150	111.4	360	174.2
17	18.5	54	57.8	155	113.3	370	176.5
18	19.9	56	59.3	160	115.4	380	178.7
19	21.4	58	60.8	165	117.4	390	180.7
20	22.8	60	62.4	170	119.3	400	183.1
21	24.1	62	63.9	175	121.2		
22	25.5	64	65.4	180	123.0		
23	26.8	66	66.8	185	124.8		
24	28.0	68	68.2	190	126.6		

T3127

Figure 9—Pressure-Temperature Relationship of R-134a



A/C – HEATER VACUUM SELECTOR VALVE OPERATING CHART

CONNECTION	PORT	OFF	MAX	NORM	BI-LEV	VENT	HTR	BLEND	DEF
DEFROST	1	VENT	VAC	VAC	VENT	VAC	VENT	VENT	VAC
A/C	2	VENT	VAC	VAC	VAC	VAC	VENT	VENT	VENT
NOT USED	3	VENT	VENT	VENT	VENT	VENT	VENT	VENT	VENT
HEAT	4	VAC	VENT	VENT	VENT	VENT	VAC	VENT	VENT
RECIRC	5	VENT	VAC	VENT	VENT	VENT	VENT	VENT	VENT
SOURCE	6	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC

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Figure 10—Vacuum Schematic

Inspect

If a malfunction in the refrigerant system is suspected due to abnormal system pressures, inspect the following:

- Outer surfaces of radiator and condenser cores. Make sure airflow is not blocked by dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.
- Evaporator core, condenser core, hoses, tubes, etc. for restrictions and kinks.
- Refrigerant leaks.
- All air ducts for leaks or restrictions. Low air flow rate may indicate a restricted evaporator core.

If the problem is not found, continue with diagnostic procedures intest 1 and 2 for the system.

Compressor Motor Insulation Test # 1 (MEGGAR)

CAUTION: To reduce the risk of severe shocks, burns, and personal injury, the high-voltage system should be disabled prior to servicing the vehicle.

1. Turn the ignition switch to the OFF position.
2. Disable the high-voltage system Refer to Battery Pack Controls.
3. Disconnect the compressor wire from the Accessory Power Module (APM).
4. Using J-42563 Power Steering and Air Compressor Tester, connect the A/C compressor test lead from the tester to the APM.

NOTICE: ***The power steering test lead from J-42563 must be connected to the test port of the test tool. Failure to do will produce erroneous results.***

5. Rotate the test knob of J-42563 to the PHASE FREQUENCY (Hz) & INSULATION TESTS.
6. Using J-42502 Digital Insulation Tester assemble the test leads into the back of the tester.

NOTICE: ***Make sure that the black test lead is in the EARTH (ground) and the orange test lead is installed in the LINE (line probe). Failure to do may lead to inaccurate results and tester malfunction.***

NOTICE: ***Make sure that the test leads are completely seated into the tester.***

7. Connect the EARTH ground (black lead) and the Line Probe (orange lead) to the J42502 Digital Insulation Tester.
8. Connect the EARTH ground (black lead) to the J-42563 Power Steering and A/C Tester motor wire harness connector body.
9. Set the J-42502 Digital Insulation Tester to the 500 volt range.
10. Make sure that the banana plug adapter is attached to the line probe on the J-42502 Digital Insulation Tester and connect to the red side of the J-42563 Power Steering and A/C Tester connector.

CAUTION: When the meter lift handle is lifted, voltage potential is possible across the meter. To prevent electrical shock and burns, always have the digital insulation tester hooked up and ready to take readings. In addition make sure that the probe ends are covered and not in contact with anything when the meter is not in use.

11. Lift the meter measure handle on the J-42502 Digital Insulation Tester. A red LED illuminated on the right upper top corner indicates high-voltage is present across the tool.
12. With the meter measure handle lifted, record the readings on the J-42502 Digital Insulation Tester.
13. Readings should be between 5.0 Ohms (5.0 Meg-0 Ohms) and infinity.
14. If readings are not within specifications replace the air conditioning motor.
15. If readings are within specifications, refer to Compressor Electrical Test # 2 in this section.

COMPRESSOR MOTOR ELECTRICAL TEST # 2 (HEAT PUMP COMPRESSOR ELECTRICAL TEST)

CAUTION: To reduce the risk of severe shocks, burns, and personal injury, the high-voltage system should be disabled prior to servicing the vehicle.

1. Turn the ignition switch to the off position.
2. Disable the high-voltage system. Refer to Battery Pack Controls.
3. Disconnect the compressor wire from the Accessory Power Module (APM).
4. Using J-42563 Power Steering and Air Compressor Tester, connect the A/C compressor test lead from the tester to the APM.
5. Connect J-39200 DMM leads to the J-42563 Power Steering and A/C Tester.

NOTICE: ***Do not connect the test lead from the J-42563 Power Steering and A/C Tester to the APM at this time.***

NOTICE: ***The power steering test lead from J-42563 must be connected to the test port of the test tool. Failure to do will produce erroneous results.***

Important

- When using a DMM on the ohmmeter scale, make sure that the circuit or component is disconnected from the power source. Failure to do so can cause damage to the meter.

6. Using J-39200 set meter to the ohmmeter setting.
7. Measure the air conditioning compressor motor winding resistance at the switch points A-B, B-C, A-C and compressor interlock.
8. Resistance at switch points A-B, B-C and A-C should be between 0.8-2.0 ohms at operating range of 50° C (120° F).
9. Resistance at compressor interlock should be between 1.0 ohm at operating range approximately 50° C (120° F).
10. If resistance readings are not within specifications replace compressor motor refer to Compressor under On-Vehicle Service in this section.
11. Using J-42563 Power Steering and A/C Tester connect the APM test lead to the APM.
12. Using J-39200 DMM set the meter to the A/C voltage setting.
13. Enable the high-voltage system. Refer to Battery Pack Controls.
14. Connect a scan tool to the vehicle.
15. Turn the ignition switch to the ON position and clear any Battery Pack Control Module (BPCM) DTC(s).
16. Select A/C MAX and place the blower switch on HIGH. Allow the system to stabilize (approximately five minutes) before taking any readings.

CAUTION: The J-42563 Power Steering and A/C tester and DMM J-39200 may have up to 230 volts stored in them.

17. Measure the A/C voltage at switch points A-B, B-C and A-C.
18. The A/C voltage readings should be within 10 volts of each other. If they are not replace the (APM).

VACUUM SYSTEM

Ports on rotary vacuum valves are illustrated to provide simplicity in following vacuum schematic lines but are numbered in consecutive order on the actual valve (Figures 10 through 13).

Turn the ignition switch to the ON position and allow system to stabilize. Move the rotary knob to each position and refer to the vacuum diagrams and operational charts for airflow, air door functioning, and vacuum circuits. If airflow is not out of the proper outlet at each rotary knob position do the following:

Inspect

1. The hose connections at the vacuum actuator's, control head valve, and vacuum tank.
2. The vacuum source circuit:
   - Install a vacuum tee and gauge (with restrictor) at the vacuum tank outlet and read the vacuum. At all selector lever positions, normal vacuum is equivalent to vacuum pump.
   - If vacuum is less than normal at all positions, remove the tee and connect the vacuum gauge line to the tank and read the vacuum. If still low, then the problem lies in the feed circuit, the feed circuit to the tank or in the tank itself. If vacuum is now normal, then the problem lies downstream.
   - Vacuum may be less than normal at some positions. If vacuum was low at one or several of the selector lever positions, a leak is indicated in these circuits.
   - Vacuum may be normal at all positions. If vacuum was normal and even at all positions, then the malfunction may be caused by improperly connected or plugged or split lines or a malfunctioning vacuum valve or valves.
3. Specific vacuum circuit check:
   - Place the rotary knob in the malfunctioning position and check for vacuum at the pertinent vacuum actuator's.
   - If vacuum exists at the actuator but the door does not move, then the actuator is defective or the door is mechanically bound.
   - If low or no vacuum exists at the actuator, determine whether the cause is the vacuum harness or the vacuum valve.
   - Check the vacuum harness first.
4. Vacuum harness circuit check:
   - Disconnect the vacuum harness at the control head.
   - The gray line should show vacuum pump vacuum. If not, trace back through the connector to the vacuum tank.
   - To check any individual circuit, place the selector lever at the involved circuit position and check for vacuum.

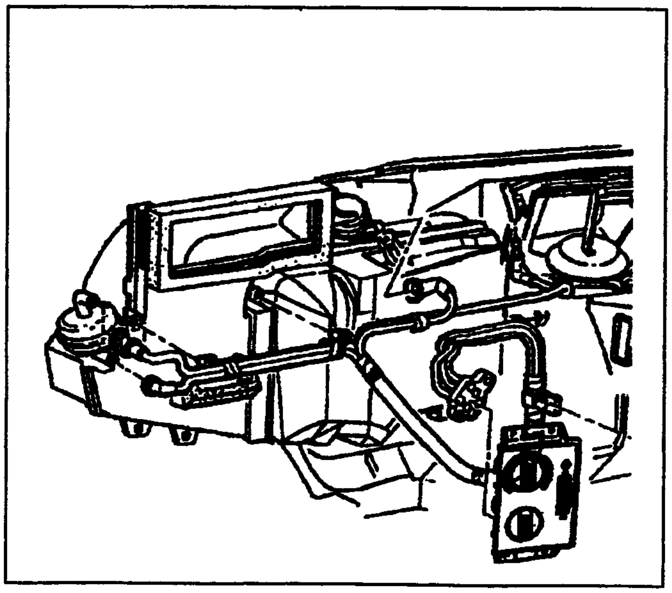

Figure 11—Vacuum Harness Routing

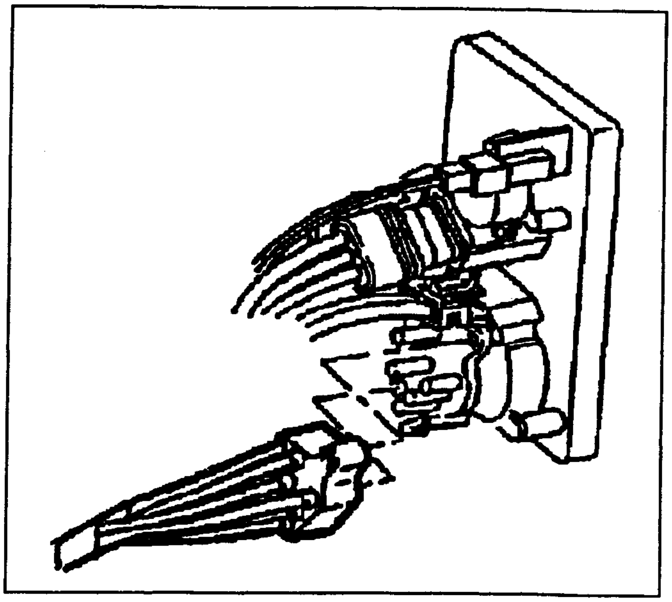

Figure 12—Vacuum Harness to the Rotary Valve

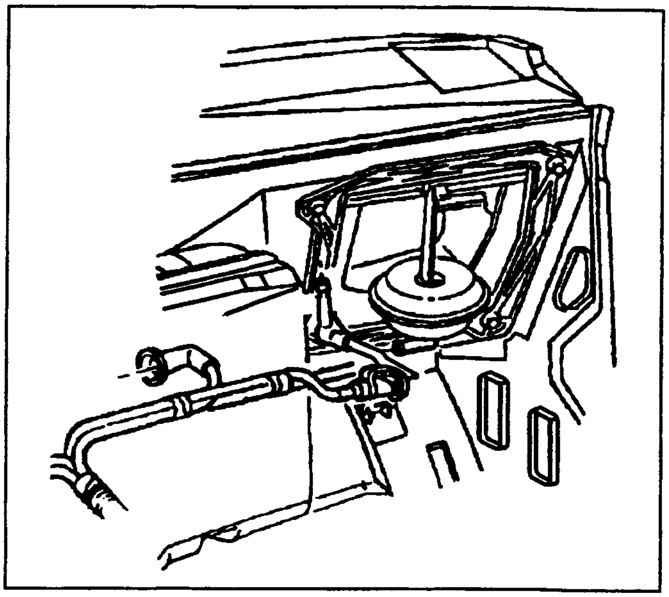

Figure 13—Vacuum Harness to the Air Inlet Valve

LEAK TESTING

CAUTION: Avoid breathing A/C Refrigerant-134a and lubricant vapor or mist. Exposure may irritate eyes, nose, and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If accidental discharge occurs, ventilate the work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

Perform a refrigerant leak test on the system whenever a leak is suspected and after performing a service operation that disturbs the components, lines, or connections. Many methods and special tools are available for this purpose; however, no matter which tool is used, care and diligence are the biggest keys to success.

Electronic Leak Detector

Tool Required:

J 39400 Electronic Leak Detector

This type of electronic leak detector has been found to be the most useful tool in locating refrigerant leaks. The J 39400 operates on 12V DC and provides an audible signal that increases in frequency as R-134a is detected (Figure 14). Make sure the instrument is properly calibrated, according to the included instructions, and that the detector is used in the proper setting for the type of refrigerant being tested. The detector GAS switch should be placed in the R-134a setting prior to use.

The most common leaks are found at the refrigerant fittings or connections (Figures 15 and 16). This may be caused by improper torque, damaged O-ring seals, lack of lubricant on O-ring seals, or dirt/debris across the O-ring seals. Even the smallest piece of lint from cotton gloves or shop cloths can create a leak path across an O-ring seal.

The successful use of this and any other electronic leak detector depends greatly upon the scan rate and upon carefully following the manufacturer's instructions regarding calibration, operation, and maintenance. Each joint must be completely circled moving at 25-51 mm (1-2 in) per second with the tip of the probe as close to the surface as possible but no more than 6 mm (0.25 in) away and without blocking the air intake. A leak is indicated when the audible tone goes from a steady 1-2 clicks per second to a solid alarm. The balance knob should be adjusted frequently to maintain the 1-2 clicks per second rate.

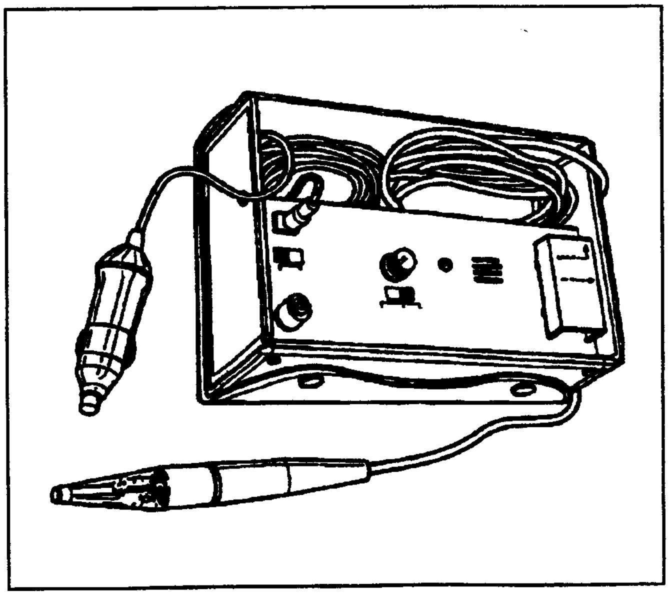

Figure 14—Electronic Leak Detector

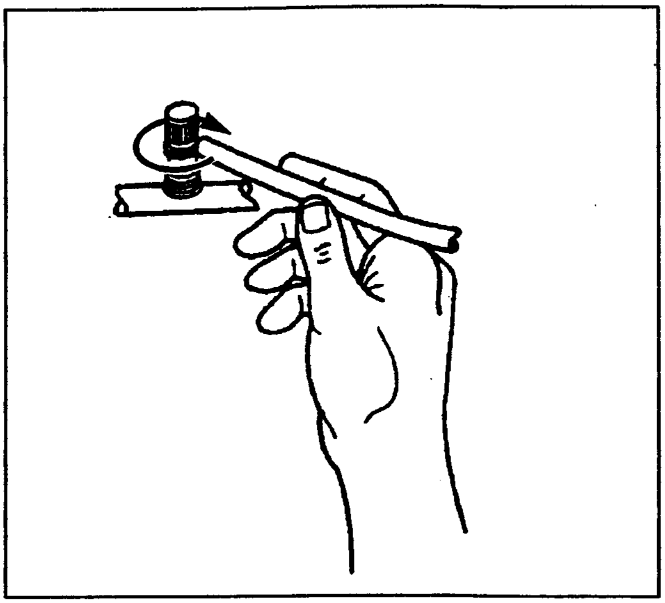

Figure 15—Testing Valve for Leaks

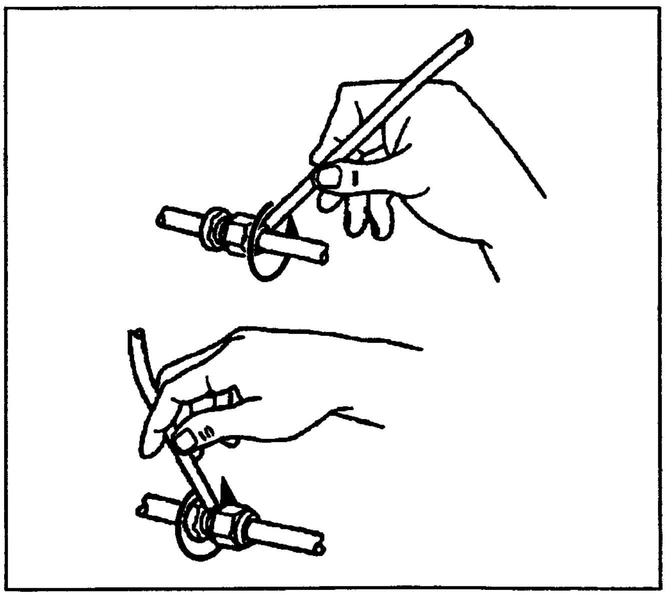

Figure 16—Testing Line for Leaks

Important

- Electronic leak detectors are sensitive to windshield washing solutions, many solvents and cleaners, and some adhesives used in the vehicle. Prevent a false warning by making sure surfaces are clean. Also, surfaces should be dry since ingestion of liquids will damage the detector.

The evaporator inlet and outlet, accumulator inlet and outlet, condenser inlet and outlet, all brazed and welded areas, areas showing signs of damage, hose couplings, compressor rear head, and housing joints may be tested using this procedure.

Important

- Always follow the refrigerant system around in a continuous path so that no areas of potential leaks are missed. Always test all the above areas to make sure the entire system is leak free, even when one leak is already found.

CAUTION: Take care to prevent personal injury that could occur while touching a hot system when testing. Tests should be done with the system off and as cool as possible. Do not operate the detector in a combustible atmosphere since its sensor operates at high temperature.

Service Ports/Access Valves

The primary seal for the service ports is the sealing cap. This cap contains a specially designed O-ring seal or gasket that provides a leak-free seal. Should the cap be loose, missing, or the wrong cap used, it will result in the loss of refrigerant charge.

Evaporator Core

One of the most difficult leaks to find is in the evaporator core. To leak test the core:

1. Turn the blower fan on HI for 15 or more seconds then turn it off.
2. Wait 10 minutes.
3. Remove the blower motor resistor. Refer to Blower Motor Resistor in this section.
4. Insert the leak detector probe as close to the evaporator as possible. If the detector goes to a solid alarm, a leak has been found.
5. If possible, visually inspect the core face with a flashlight for evidence of refrigerant oil.

BLOWER NOISE

A constant air rush noise is typical of high-speed blower operation. Some systems and modes may be noisier than others. If possible, check another similar vehicle to determine whether the noise is typical or excessive.

Sit in the vehicle with the doors and windows closed. With the ignition ON and the system not running, run the blower on HI speed with the temperature set for maximum cooling. Cycle through the blower speeds, modes, and temperature settings to find where the noise does not occur. Try to define the types of noise.

- Noise is constant, but decreases with blower speed reduction. Typical noises are a whine, tick/click, flutter, or scrape.
- Noise is only at startup or intermittent. This noise may occur at cold ambient and low blower speeds. Typical noise is a squeal/screech.
- Noise is constant at high blower speeds in certain modes, but can be eliminated at lower blower speeds in other modes. Typical noises are a flutter or rumble.

If the noise persists, remove the blower assembly and check for obstructions or foreign material causing noise and remove. If no obstructions are found and the noise is still heard, replace the blower assembly.

DIAGNOSIS OF AIR CONDITIONING (HEATER)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Inadequate Defrosting	1. Obstruction in defroster nozzle.	1. Both defroster nozzle outlets should be inspected. Any foreign objects should be removed. Any loose instrument panel pad that blocks an outlet should be repaired.
	2. Damaged defroster nozzle outlet.	2. The outlet flange should be carefully reshaped with pliers so the outlet opening is uniform. If the outlet flange cannot be reshaped, the air distributor should be replaced.
	3. Faulty mode actuator.	3. Defroster air valve operation should be checked. A faulty mode actuator should be replaced.
	4. Insufficient heat.	4. Refer to Insufficient Heating of Passenger Compartment in this chart.
Inoperative Blower	1. Blown fuse.	1. The fuse should be replaced.
	2. Open circuit.	2. Check the circuit between the ignition switch and the blower motor, and the blower motor ground circuit. Repair as necessary.
	3. Faulty blower switch.	3. A faulty blower switch should be replaced.
Insufficient Heating of Passenger Compartment	1. Incorrect operation of controls.	1. The driver should be advised of proper operation of controls.
	2. Low engine coolant level.	2. Coolant should be added as needed. A check should be made for coolant leaks. The engine should be run to clear any air locks.
	3. Faulty engine thermostat.	3. The thermostat should be checked and replaced if necessary.
	4. Kinked heater hose.	4. Hoses should be checked and kinks should be straightened or hoses replaced as necessary.
	5. Obstructed heater core tubes.	5. An obstruction usually causes a swishing noise in the core. Any foreign material should be removed from the core or the core should be replaced.
	6. Faulty blower motor or blower circuit.	6. Faulty wires or connections must be repaired or replaced. A faulty blower motor must be replaced.
	7. Faulty heater water valve or solenoid or control circuit. (If equipped.)	7. Check that the water valve closes when temp control is moved to coldest setting. If not, check electrical connections between control head and solenoid and vacuum line connections between engine and solenoid, and solenoid and water valve. Water Valve should open when temp control is moved several notches off of coldest setting.
Cold Drafts on Floor	1. Partially open air inlet valve.	1. The air inlet valve should close properly in all modes except recirculation mode. Repairs should be made as necessary.
	2. Side door seals damaged or missing.	2. All door seals should be inspected. Faulty seals should be repaired or replaced as necessary.

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REFRIGERATION SYSTEM SERVICES

Important

- Before attempting any service that requires opening refrigerant lines or components, the person doing the work should be thoroughly familiar with the information under Handling Refrigerant 134a Handling Refrigerant Lines and Fittings and Maintaining Chemical Stability. Very carefully follow the instructions in the Refrigerant Recovery and Recycling, Adding Oil, Evacuating, and Recharging Procedures for the unit being serviced.

REPLACING O-RING SEALS

Install new GM-approved service replacement air conditioning O-ring seals whenever a joint or fitting is installed, except when the O-ring seals are provided on new replacement components. Unless service replacement O-ring seals bearing the specified part numbers are used, excessive leakage of Refrigerant-134a may occur. Refer to the part number for identification.

Air conditioning O-ring seals should be coated with 525 viscosity refrigerant oil just before installation and should be slipped onto the flange tube to ensure proper locating and sealing. To prevent the possibility of swelling and a reduction in sealing effectiveness, O-ring seals should not be soaked in refrigerant oil. Before installation, O-ring seals and fittings should be examined to ensure they have not been nicked or deformed. Replace nicked or deformed parts to prevent refrigerant leakage.

HANDLING REFRIGERANT-134a

CAUTION: Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose, and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

Important

- Never mix R-12 refrigerant and R-134a refrigerant, even in the smallest of amounts. They are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur.
- Use only specified lubricant for the R-134a A/C system and R-134a components. If lubricants other than those specified are used, compressor failure is likely to occur. Coat all fittings and O-ring seals with clean 525 viscosity refrigerant oil to provide a leak-proof seal and to aid in assembly and disassembly.
- Do not store or heat refrigerant containers above 125°F(52°C).
- Do not heat a refrigerant container with an open flame. If the container must be warmed, place the bottom of the container in a pail of warm water.
- Do not intentionally drop, puncture, or incinerate refrigerant containers.
- Refrigerant will displace oxygen, so be certain to work in well ventilated areas to prevent suffocation.
- Do not introduce compressed air to any refrigerant container or refrigerant component. Contamination will occur.
- If it is necessary to carry a container of Dot CFR Refrigerant-134a in a vehicle, do not carry it in the passenger compartment.

All blue Refrigerant-134a disposable containers are shipped with a heavy metal screw cap to protect the valve and safety plug of the container from damage. Replace the cap after each use of the container to continue protection.

HANDLING OF REFRIGERANT LINES AND FITTINGS

Important

- Before opening the refrigeration system, make sure the work area is well ventilated. Welding or steam-cleaning operations should not be done on or near refrigeration system lines or other air conditioning parts on the vehicle.

All metal tubing lines should be free of dents or kinks to prevent loss of system capacity due to line restriction.

- The flexible hose lines should never be bent to a radius of less than four times the diameter of the hose.
- The flexible hose lines should never be allowed to come within a distance of 6.5 mm (2.5 in) of the exhaust manifold.

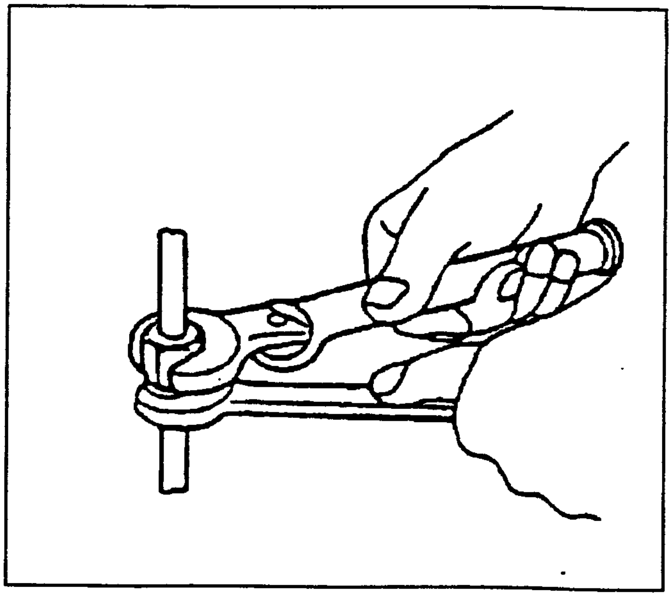

Figure 17—Using the Two Wrench Method

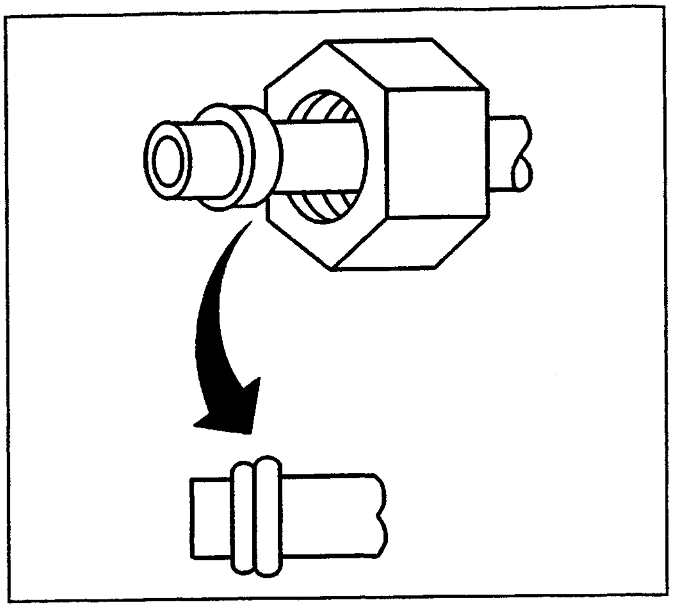

Figure 18—Proper O-ring Installation

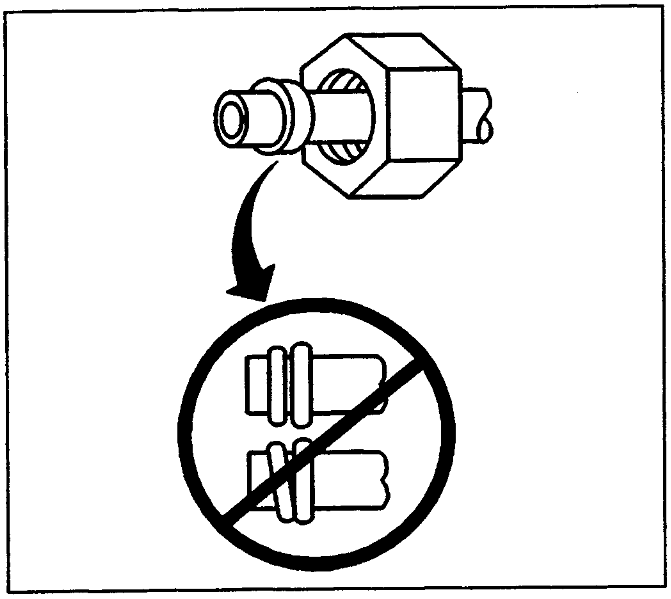

Figure 19—Improper O-ring Installation

- Flexible hose lines should be inspected regularly for leaks or brittleness. Replace with new lines if deterioration or leaking is found.
- When disconnecting any fitting in the refrigerant system, recover all Refrigerant-134a. However, proceed very cautiously, regardless of the gauge readings. Open very slowly, keeping your face and hands away so that no injury can occur. If pressure is noticed when a fitting is loosened, allow it to bleed off very slowly.

NOTICE: ***Never use alcohol in the refrigeration system to remove moisture. Damage to the system components may occur.***

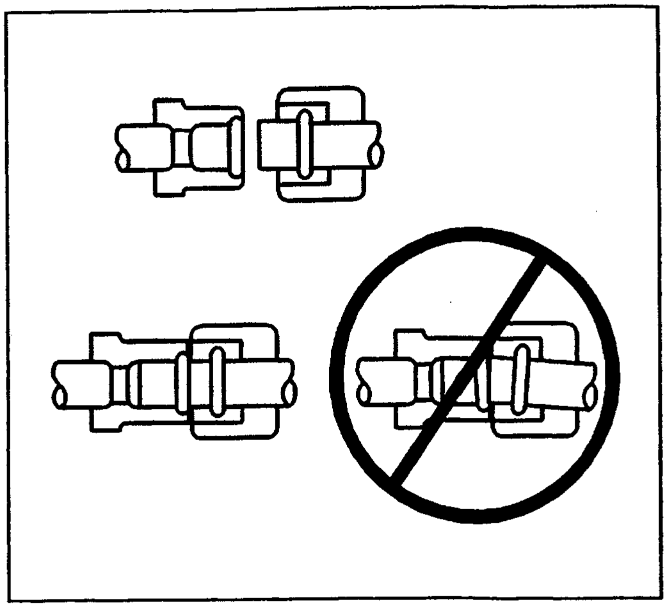

Figure 20—Refrigerant Line Installation

- If any refrigerant line is opened to the atmosphere, cap it immediately to prevent the entrance of moisture and dirt. These can cause internal compressor wear or plugged lines in the condenser and evaporator core and expansion (orifice) tubes or compressor inlet screens.
- Remove sealing caps from subassemblies just before making connections for final assembly. Use a small amount of clean 525 viscosity refrigerant oil on all tube and hose joints. Use new O-ring seals dipped in 525 viscosity refrigerant oil when assembling joints. The oil will aid in assembly and help to provide a leakproof joint. O-ring seals and seats must be in perfect condition. A burr or a piece of dirt can cause a refrigerant leak.
- Use the proper wrenches when making connections on O-ring seal fittings (Figure 17). Using improper wrenches may damage the connection. The opposing fitting should always be backed up with a wrench to prevent distortion of connecting lines or components. When connecting the flexible hose connections, it is important that the swaged fitting and the flare nut, as well as the coupling to which it is attached, be held at the same time using three different wrenches to prevent turning the fitting and damaging the seat (Figures 18, 19, and 20).

Tighten tubing connections to the specified torque. Refer to Specifications in this section.

MAINTAINING CHEMICAL STABILITY

The life and efficient operation of the air conditioning system depends upon the chemical stability of the refrigerant system. When foreign materials, such as dirt, air, or moisture, contaminate the refrigeration system, they change the stability of the Refrigerant-134a and Electric Vehicle Ester refrigerant oil. They will also affect the pressure-temperature relationship, reduce efficiency, and could cause internal corrosion and abnormal wear of moving parts.

The following general practices should be followed to ensure chemical stability in the system:

1. Whenever it becomes necessary to disconnect a hose connection, wipe away any dirt or oil at or near the connection to eliminate the possibility of dirt entering the system. Both sides of the connection should be capped, plugged, or taped as soon as possible to prevent the entrance of dirt and moisture. (Remember that all air contains moisture. Air that enters any part of the refrigeration system will carry moisture with it, and the exposed surfaces will collect the moisture quickly.)
2. Keep tools clean and dry. This includes the Manifold Gauge Set and all replacement parts.
3. When adding Electric Vehicle Ester Refrigerant Oil, the container/transfer tube through which the oil will flow should be exceptionally clean and dry. Refrigerant oil must be as moisture-free as possible.
4. When it is necessary to open an air conditioning system to the atmosphere, have everything needed ready so that as little time as possible will be required to perform the operation. Do not leave the air conditioning system open any longer than necessary.
5. Anytime the air conditioning system has been opened it should be properly evacuated before recharging.

REFRIGERANT AND OIL CAPACITY

The refrigerant system requires refrigerant and oil in quantities listed:

Refrigerant-134a

- 0.9kg (2.0 lb)

Refrigerant Oil

Panasonic RB68EV Polyol Ester Refrigerant Oil
* Panasonic Compressor - 400ml (13.52 fl oz)

Important

- Overcharging a system may allow liquid Refrigerant-134a to get into the compressor causing compressor noise and damage. Undercharging will cause insufficient cooling.

REFRIGERANT RECOVERY AND RECYCLING, ADDING OIL, EVACUATING AND RECHARGING PROCEDURES

For information on the proper procedures for recycling, adding oil, evacuating and recharging refer to the instructions provided by the equipment manufacturer.

CAUTION: Always wear goggles and gloves when doing work that involves opening the refrigeration system. If liquid refrigerant comes into contact with the skin or eyes, injury may result.

NOTICE: *Before using the A/C evacuation and charging machine, always blow compressed air through the hoses to purge hoses of any old compressor oil. The presence of any oil other than Panasonic RB68EV Polyol Ester refrigerant oil in the compressor will cause compressor failure.*

NOTICE: *This vehicle must be evacuated slowly to prevent the removal of oil from the compressor sump. The evacuation may be performed from either the HIGH side service port only, or the HIGH AND LOW side service ports simultaneously. An evacuation from the LOW side service port only will not guaranty total evacuation.*

NOTICE: *The S-10 Electric Truck must be charged at the HIGH side service port of the compressor and only when the A/C compressor is OFF. If a full charge is executed from the LOW side service port, the large amount of liquid refrigerant is likely to wash the lubricant from the compressor bearing surfaces. This will cause excessive wear to compressor components and lead to premature compressor failure.*

NOTICE: *Never add refrigerant to the high side service port of the A/C system with the compressor running. This line may contain gas under high pressure.*

DIAGNOSIS OF THE REFRIGERANT RECOVERY, RECYCLING AND RECHARGING SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
RECOVERY OPERATION		
Recovery Compressor Does Not Start	• "Main Power" switch off. • Power cord not plugged in or no power at plug. • "Full" on digital display. • "Hi-P" on digital display. • Faulty components.	• Turn on "Main Power" switch. • Check circuit for power. • Change the tank according to the manufacturer's instructions. • Check the valves on the unit tank to be sure they are open. • Operate recycling only to activate automatic air purge. Excessive air raises the tank presure. Refer to manufacturer's instructions.
Runs A Short Time, But Does Not Complete Recovery	• Tank valves not open. • Manifold valves not open. • Faulty components.	• Open both valves on the tank. • Open both valves on the manifold.
Runs But Won't Shut Off	• Oil drain valve not closed. • Leak in vahicle system. • Return oil solenoid valve open. • Faulty components.	• Close the oil drain valve. • Locate and repair system leak. • Replace solenoid valve.
RECYCLING OPERATION		
Moisture Indicator Will Not Turn Green During Automatic Recycling (Occurs During A/C System Evacuation)	• Saturated filter-drier. • Faulty moisture indicator.	• Remove and replace filter-drier following manufacturer's instructions. • Remove and replace the moisture indicator.
Refrigerant Does Not Flow During Recycling	• Refrigerant supply empty or low. • Faulty moisture indicator.	• Check display for "CHECK REFRIGERANT". If shown, add more refrigerant before recycling. Refer to manufacturer's instructions. • Open the valves.
No Power When POWER Switch Is On—No Display Showing	• Unit unplugged. • No power at wall outlet.	• Plug unit into power source outlet. • Locate problem with outlet or change outlets.
Vacuum Pump Does Not Start	• Vacuum pump unplugged. • Check extension cord (if used). • Faulty components.	• Plug pump into power source. • Try without extension cord.
Audible Tone Sounds During Refrigerant Transfer	• Transfer stopped or too slow. • Refrigerant supply low.	• Start vehicle A/C system and pull rest of refrigerant into system. • Add refrigerant to the tank. Refer to manufacturer's instructions.
Vacuum Pump Runs, But Low Side Gauge Does Not Register An Appropriate Vacuum	• Low side valve closed. • Pump oil contaminated. • Charging line loose. • Manifold leaking.	• Open low side valve. • Change oil. Refer to manufacturer's instructions. • Check connections. • Check connections.

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A/C ODOR DIAGNOSIS

PROBLEM	POSSIBLE CAUSE	CORRECTION
Musty Smell	1. Water leaks (body). 2. Evaporator drain. 3. Mold/mildew.	1. Seal body. 2. Clean drain. 3. Clean evaporator.
Coolant Smell	1. Anti-freeze.	1. Heater core. 2. Heater pipe/hoses.
Refrigerant Leak	1. Refrigerant oil.	1. Evaporator core.

NOTE: MOLD/MILDEW ODOR PROBLEM — Under certain climate and operating conditions a musty odor develops from mold growth in the evaporator core face. This odor is generally temporary and as climate conditions change will disappear and repair on its own. However, if odor persists, it will become necessary to remove evaporator core and clean the face with appropriate cleaner.

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AIR CONDITIONING SYSTEM ODOR PROCEDURE

Odors may be emitted from the air conditioning system primarily at startup in hot, humid climates. This odor may be the result of debris in the heater/evaporator case or growth of mold on the evaporator core. To address this condition, use the following equipment and procedure.

Tools Required:

J 36645 Air Conditioning Cleaning Gun
GM Goodwrench Air Conditioning System Disinfectant Kit

CAUTION: Procedure should only be performed on a cold vehicle to prevent the disinfectant from coming in contact with hot system components. Disinfectant can cause substantial but temporary eye injury. Do not get in eyes or clothing. Wash thoroughly with soap and water after handling.

Important

- If disinfectant gets into eyes, hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Obtain medical attention if irritation persists.

1. Put on rubber gloves and safety goggles.
2. Pour the small bottle of the two-part GM Goodwrench Air Conditioning System Disinfectant Kit into the large bottle. Seal and invert the large container once or twice to mix contents.
3. Check underneath the vehicle to verify that drain outlet is not plugged.
4. Connect battery charger to avoid draining the battery during cleaning procedure.
5. Remove blower resistor. Leave electrical connectors attached. Refer to Blower Motor Resistor in this section.

NOTICE: ***Do not allow the metal coils of the blower resistor to become grounded to any metal surface. This may result in internal circuitry damage.***

6. Check heater/evaporator case for debris. Remove any debris present through blower resistor opening. If debris is imbedded into the evaporator core face and cannot be removed, remove the core from the vehicle and clean it. If a large amount of debris is present in the heater/evaporator case the air inlet screen will require sealing around the air intake in the cowl area.
7. Turn the ignition to the ON position but do not start vehicle.
8. Set mode selector to VENT, blower speed to LO, and temperature to full COLD.
9. Open all windows and doors. Exit vehicle.
10. Place a drain pan with at least a 2-quart capacity below heater/evaporator drain hole to collect disinfectant and rinse water runoff. If necessary, install additional hose onto drain so that all fluid goes into the drain pan.
11. Turn pedestal fan on HIGH to provide cross ventilation during cleaning procedure.
12. Using J 36645, or equivalent spray gun, insert the nozzle of the spray gun through the blower resistor opening and insert siphon hose into container of disinfectant. Taking extra care to ensure adequate coverage of the corner and edges, spray directly toward the evaporator face. Saturate the core completely. Use the entire container of solution.

Important

- Do not allow disinfectant to come into contact with hot system components such as the exhaust manifold.

13. Turn the ignition to the OFF position, and allow the core to soak for 5 minutes.
14. Double-check underneath the vehicle to verify proper drain operation. If necessary, unclog and increase drain plug slits with a razor blade or sharp knife.
15. Turn the ignition to the ON position, but do not start vehicle.
16. Thoroughly rinse the evaporator core with clean water using the spray gun to remove all disinfectant residue. At least a 2-quart rinse is recommended.
17. Turn the ignition to the OFF position. Reinstall the blower resistor. Refer to Blower Motor Resistor in this section.
18. Dispose of disinfectant properly and rinse water runoff collected in the drain pan in an approved manner.

ON-VEHICLE SERVICE

DRAINING AND FILLING THE COOLANT SYSTEM

CAUTION: As long as there is pressure in the coolant system, the temperature can be considerably higher than the boiling point of the solution in the system without causing the solution to boil. Removal of the pressure cap while the system is hot and pressure is high will cause the solution to boil instantaneously - possibly with explosive force - spewing the solution over the fenders and personnel removing cap. Under some conditions, the ethylene glycol in the coolant is combustible.

Draining

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.

CAUTION: The pressure cap should be removed from a cool system only. If the pressure cap is removed from a hot coolant system, serious personal injury may result.

2. Make sure the coolant system is cool, then remove the pressure cap slowly.
3. Remove the coolant from the system.
4. Drain the system completely.

Filling

1. Make sure hoses are attached and tight.
2. Place a large funnel in the reservoir fill hole.
3. Slowly pour in the coolant. The coolant system holds 6.50 liters (6.8 qts) total.
4. Install the high-voltage disconnect. Refer to Battery Pack Controls.
5. After the coolant system is filled to 12.5 mm (1/2 in) below the fill hole, start the system and let the coolant circulate through the system (approximately 3-5 minutes). As the coolant level drops, add coolant until the level is up to the fill hole.
6. Replace the pressure cap.
7. Check the coolant level in the reservoir tank and add coolant if needed.

FUEL-FIRED HEATER (FFH) RESERVOIR REPLACEMENT

←→ Remove or Disconnect (Figures 21 through 23)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove vent hose from reservoir.
3. Remove two screws securing reservoir to bracket.
4. Remove reservoir from bracket.
5. Remove coolant hoses from the reservoir.
6. Drain coolant into a clean pan.

→← Install or Connect (Figures 21 through 23)

1. Install the outlet hose coolant hose to the FFH on the lower reservoir nipple.
2. Install the inlet hose coolant hose from the heater core on the upper reservoir nipple.
3. Mount the rubber grommet onto the reservoir rosebud.
4. Mount the reservoir on the mounting bracket so that the rubber grommet slides into bracket slot.
5. Install two mounting screws to reservoir.

Tighten

- Tighten FFH reservoir mounting screws to 1.9 N.m (17 lb in).

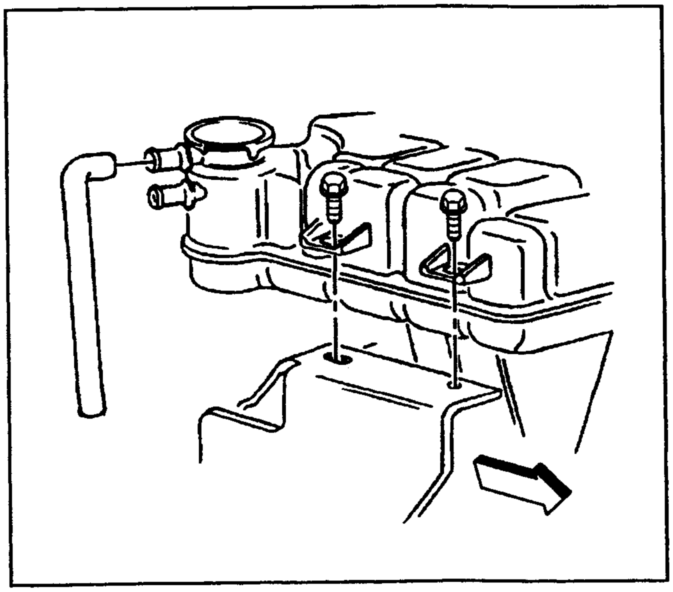


Figure 21—Fuel-Fired Heater Reservoir Installation

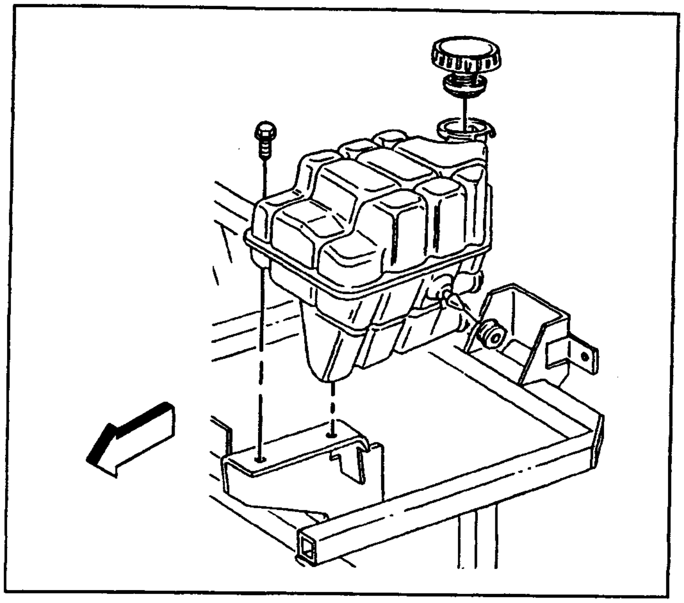


Figure 22—Fuel-Fired Heater Reservoir

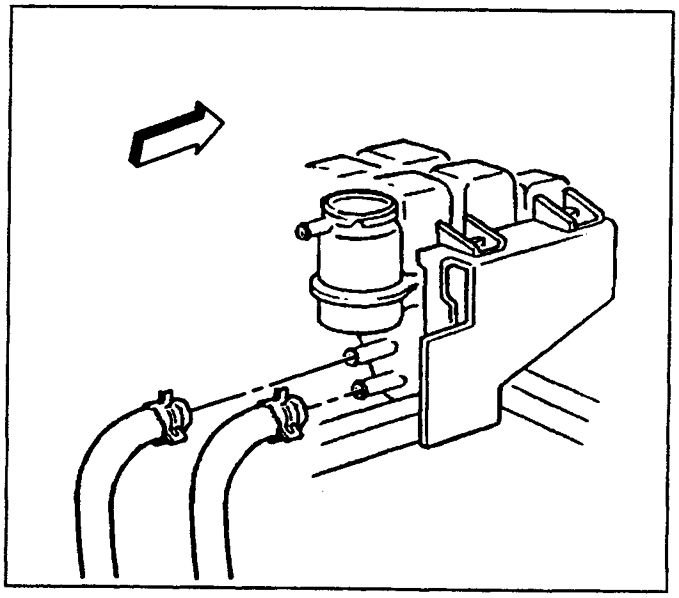


Figure 23—Coolant Fuel-Fired Heater Reservoir

6. Install vent hose on reservoir
7. Fill reservoir with clean coolant.
8. Install the high-voltage disconnect. Refer to Battery Pack Controls.

FUEL-FIRED HEATER INLET HOSE REPLACEMENT

Remove or Disconnect (Figures 24 through 26)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the fuel-fired heater coolant reservoir from the mounting bracket. Refer to Fuel-Fired Heater Reservoir Replacement in this section.
3. Drain the reservoir coolant into a clean pan.
4. Remove the hose from the fuel-fired heater coolant reservoir.
5. Raise the vehicle on the hoist.
6. Remove the skid plate. Refer to Sheet Metal and Fiberglass.

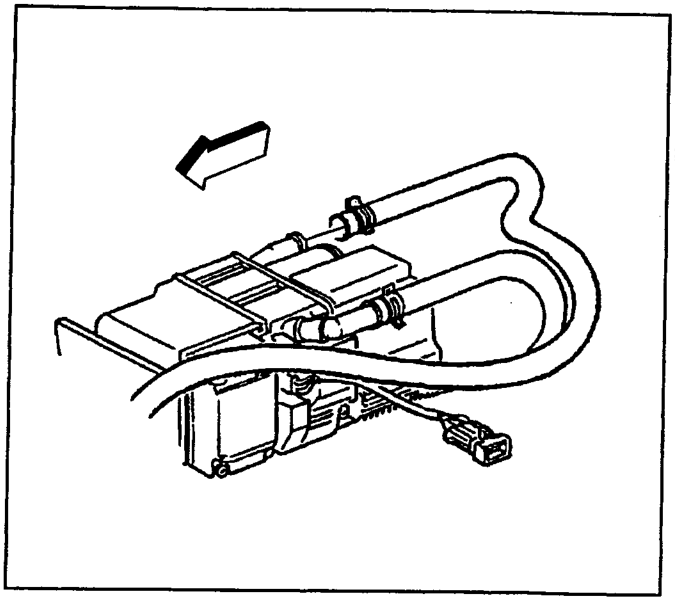


Figure 24—Hose to Heater Connection

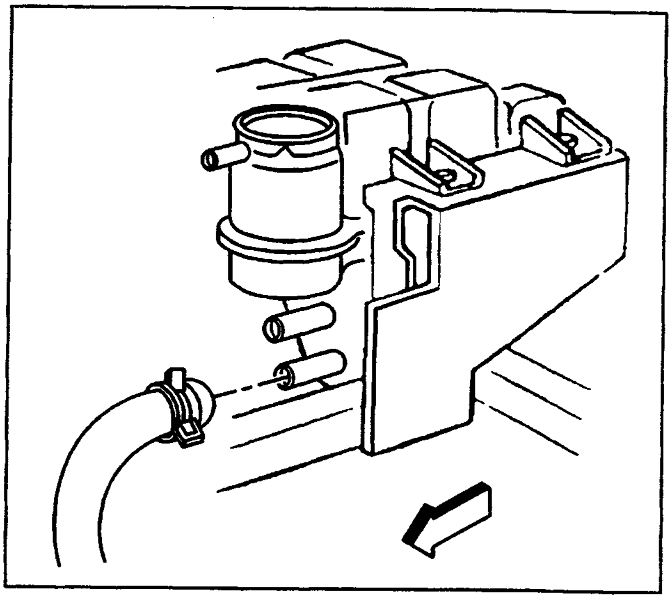


Figure 25—Hose to Reservoir Connection

7. Loosen two bolts securing the crossmember to the left frame rail.
8. Remove two bolts securing the crossmember to the right frame rail.
9. Remove the hose from the fuel-fired heater.

Install or Connect (Figures 24 through 26)

1. Install the hose and clamp to the fuel-fired heater.

Tighten

- Tighten hose clamp to 4.mn (35 lb in).

2. Install two bolts securing the crossmember to the right frame rail.

Tighten

- Tighten crossmember mounting screws to 54 N.m (40 lb ft).

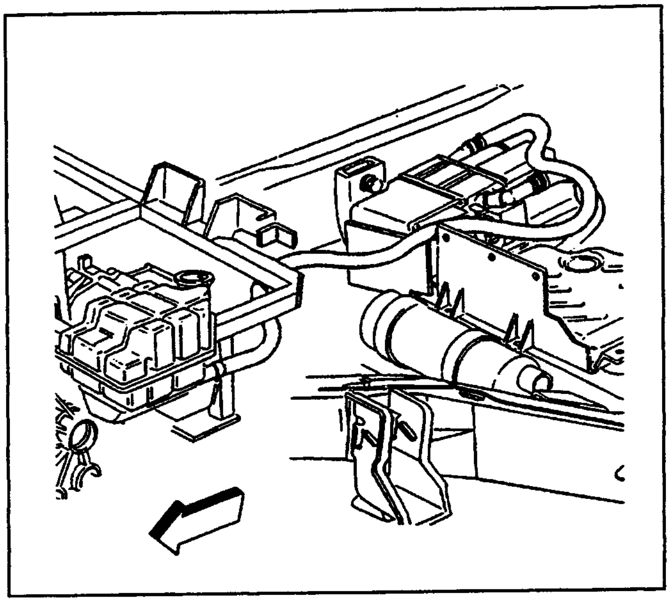


Figure 26—Fuel-Fired Heater Inlet Hose Routing

3. Tighten two bolts securing the crossmember to the left frame rail.

Tighten

- Tighten crossmember mounting screws to 54 N·m (40 lb ft).

4. Install the skid plate. Refer to Sheet Metal and Fiberglass.
5. Lower the vehicle on the hoist.
6. Install the hose to the fuel-fired heater coolant reservoir.
7. Install the fuel-fired heater coolant reservoir to it's mounting bracket. Refer to Fuel-Fired Heater Reservoir Replacement in this section.
8. Fill the coolant system. Refer to Filling the Coolant System in this section..
9. Install the high-voltage disconnect. Refer to Battery Pack Controls.

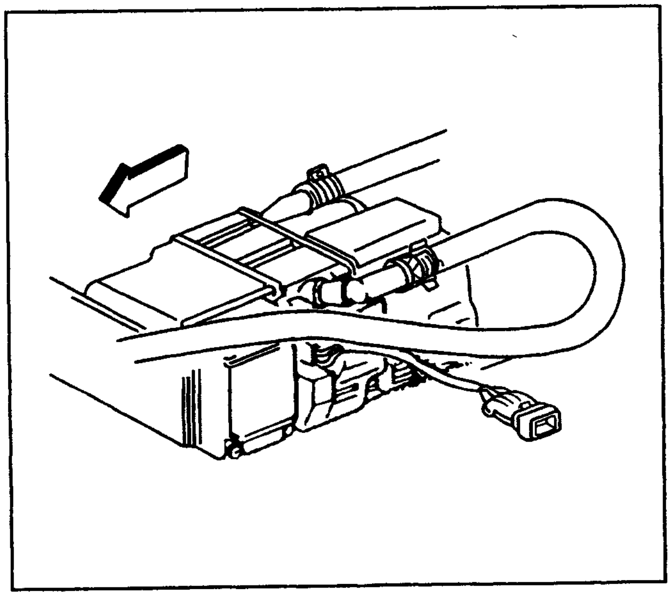


Figure 27—Hose to Fuel-Fired Heater

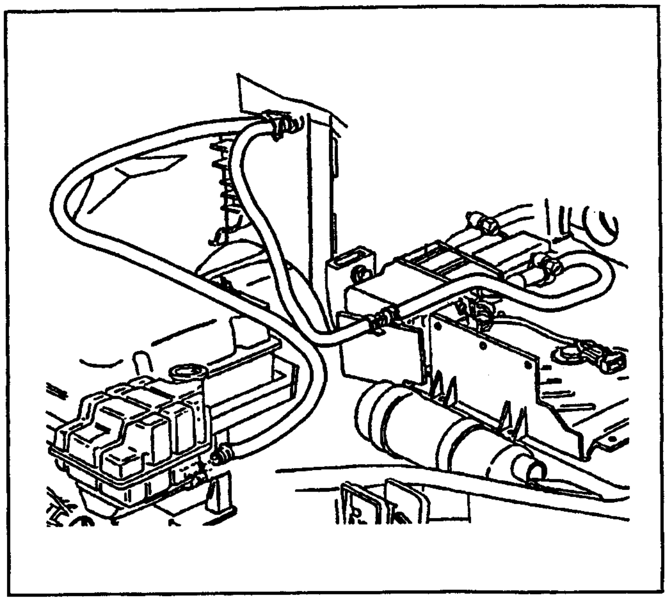


Figure 28—Hose to Heater Core Routing

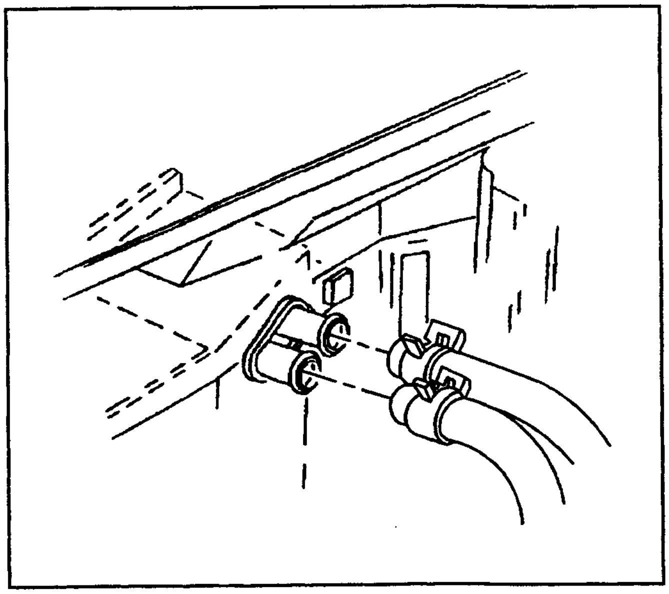


Figure 29—Heater Core Hose Connections

FUEL-FIRED HEATER OUTLET HOSE REPLACEMENT

Remove or Disconnect (Figure 27 through 29)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the hose and clamp from the heater core.
3. Raise the vehicle on the hoist.
4. Remove the skid plate. Refer to Sheet Metal and Fiberglass.
5. Loosen two bolts securing the crossmember to the left frame rail.
6. Remove two bolts securing the crossmember to the right frame rail.
7. Remove the hose from the fuel-fired heater.

Install or Connect (Figure 27 through 29)

1. Install the hose and clamp to the fuel-fired heater.

   Tighten

   - Tighten hose clamp to 4.mn (35 lb in).
2. Install two bolts securing the crossmember to the right frame rail.

   Tighten

   - Tighten crossmember mounting screws to 54 N.m (40 lb ft).
3. Tighten two bolts securing the crossmember to the left frame rail.

   Tighten

   - Tighten crossmember mounting screws to 54 N.m (40 lb ft).
4. Install the skid plate. Refer to Sheet Metal and Fiberglass.
5. Lower the vehicle on the hoist.
6. Install the hose to the heater core.
7. Fill the coolant system. Refer to Filling the Coolant System in this section.
8. Install the high-voltage disconnect. Refer to Battery Pack Controls.

RESERVOIR INLET HOSE REPLACEMENT

Remove or Disconnect (Figures 23, 28, and 29)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the fuel-fired heater coolant reservoir from the mounting bracket. Refer to Fuel-Fired Heater Reservoir Replacement in this section.
3. Drain the reservoir coolant into a clean pan.
4. Remove the hose from the fuel-fired heater coolant reservoir.
5. Remove the hose and clamp from the heater core.

Install or Connect (Figures 23, 28, and 29)

1. Install the hose and clamp to the heater core.
2. Install the hose to the fuel-fired heater coolant reservoir.
3. Install the fuel-fired heater coolant reservoir to it's mounting bracket. Refer to Fuel-Fired Heater Reservoir Replacement in this section.
4. Fill the coolant system. Refer to Filling the Coolant System in this section.
5. Install the high-voltage disconnect. Refer to Battery Pack Controls.

EXHAUST PIPE HEAT SHIELD REPLACEMENT

Remove or Disconnect (Figure 30)

1. Raise the vehicle on the hoist.
2. Remove the skid plate. Refer to Sheet Metal and Fiberglass.

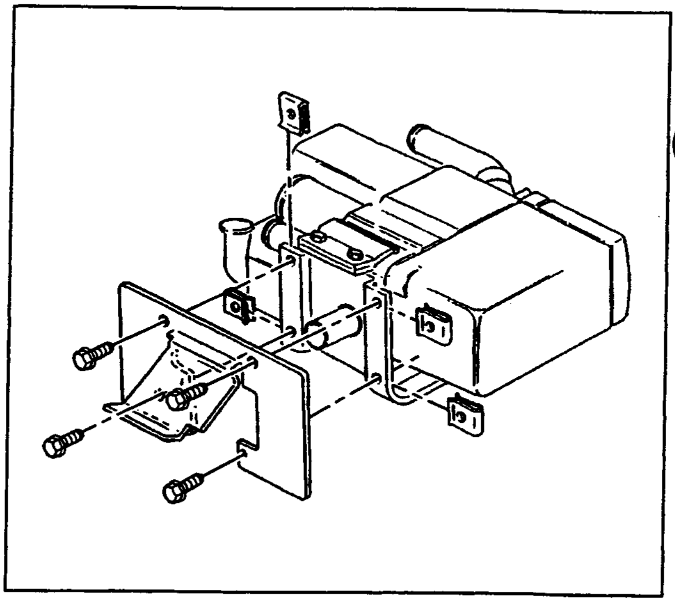


Figure 30—Exhaust Pipe Heat Shield

3. Remove four bolts securing the heat shield to the heater.
4. Remove the heat shield.

Install or Connect (Figure 30)

1. Install the heat shield to the heater with four bolts.

   Tighten

   - Tighten the bolts to 1.9 N.m (17 lb in).
2. Install the skid plate. Refer to Sheet Metal and Fiberglass.
3. Lower the vehicle on the hoist.

EXHAUST PIPE REPLACEMENT

Remove or Disconnect (Figures 31 and 32)

1. Raise the vehicle on the hoist.
2. Loosen the exhaust clamp at the fuel-fired heater.
3. Remove the exhaust pipe from the fuel-fired heater.

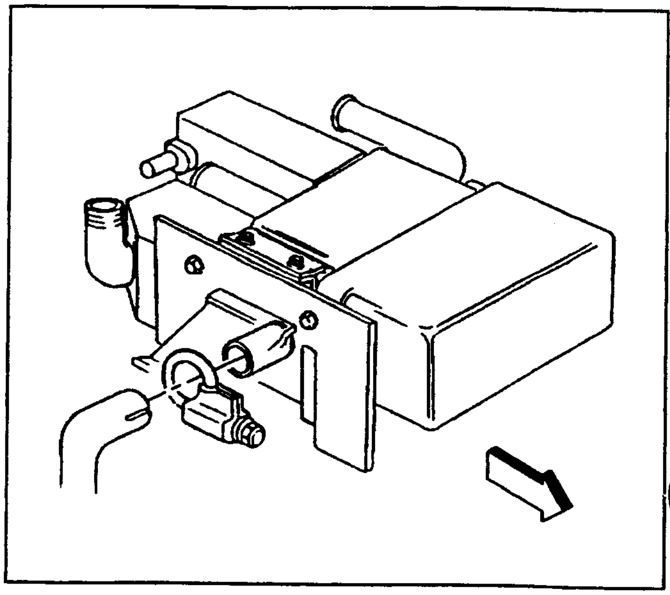


Figure 31—Fuel-Fired Heater Exhaust Clamp

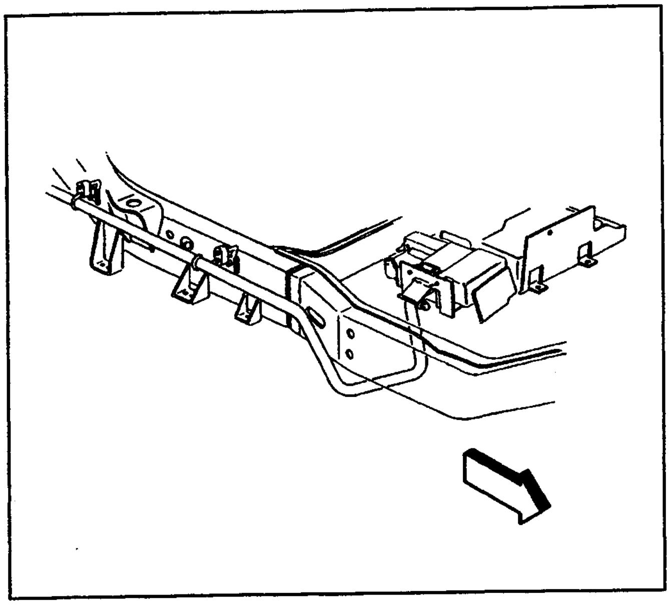


Figure 32—Fuel-Fired Heater Exhaust

4. Remove two exhaust pipe hanger rods from hanger brackets.

Install or Connect (Figures 31 and 32)

1. Install the exhaust pipe to the fuel-fired heater with exhaust clamp.

   Tighten

   - Tighten the exhaust clamp to 10 N.m (88 lb in).
2. Apply lubricant to two exhaust pipe hanger rods.
3. Install two exhaust pipe hanger rods in hanger brackets.
4. Lower the vehicle on the hoist.

EXHAUST PIPE HANGER BRACKET REPLACEMENT

Remove or Disconnect (Figure 33)

1. Raise the vehicle on the hoist.

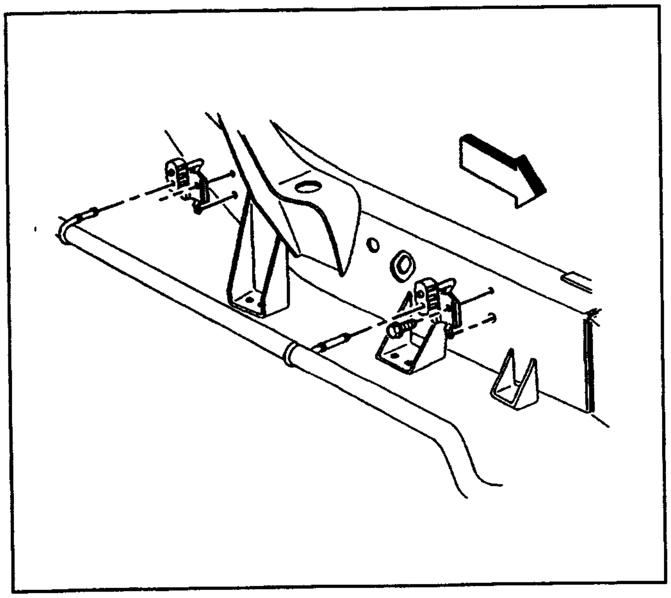


Figure 33—Exhaust Pipe Hanger Brackets

2. Remove two exhaust pipe hanger brackets from the right frame rail.
3. Remove two exhaust pipe hanger brackets from hanger bracket rods.

Install or Connect (Figure 33)

1. Apply lubricant to two exhaust pipe hanger rods.
2. Install two exhaust pipe hanger brackets on hanger bracket rods.
3. Install two exhaust pipe hanger brackets to the right frame rail.

   Tighten

   - Tighten the hanger brackets bolts to 17 N.m (150 lb in).
4. Lower the vehicle on the hoist.

FUEL-FIRED HEATER REPLACEMENT

Remove or Disconnect (Figures 34 through 36)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Raise the vehicle on the hoist.
3. Remove the skid plate. Refer to Sheet Metal and Fiberglass.
4. Remove the exhaust pipe heat shield. Refer to Exhaust Pipe Heat Shield Replacement in this section.
5. Remove the exhaust pipe. Refer to Exhaust Pipe Replacement in this section.
6. Loosen two bolts securing the crossmember to the left frame rail.
7. Remove two bolts securing the crossmember to the right frame rail.
8. Remove the inlet hose and clamp from the fuel-fired heater. Refer to Fuel-Fired Heater Inlet Hose Replacement.

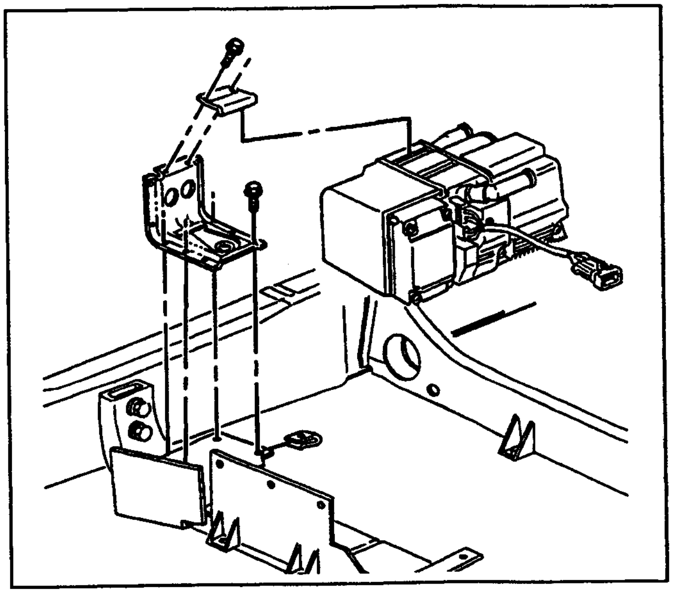


Figure 34—Fuel-Fired Heater Mounting

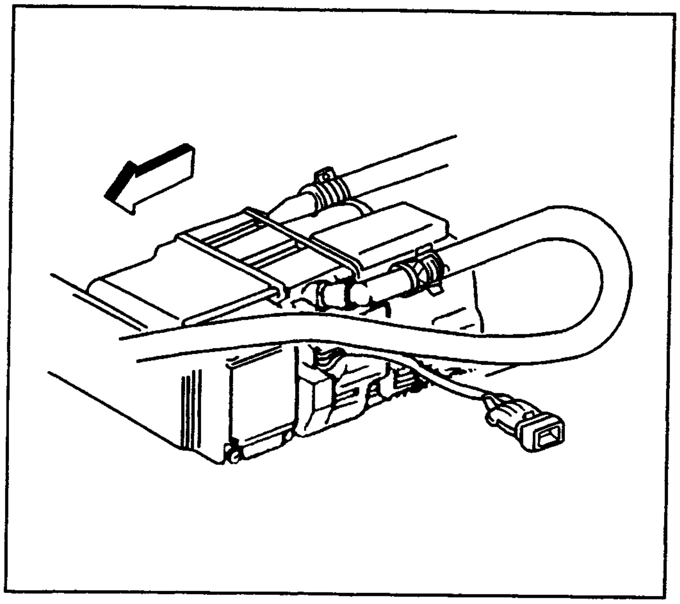


Figure 35—Coolant Hose to Fuel-Fired Heater

9. Remove the outlet hose and clamp from the fuel-fired heater. Refer to Fuel-Fired Heater Outlet Hose Replacement.
10. Remove the air inlet hose and clamp from the fuel-fired heater. Refer to Fuel-Fired Heater Air Inlet Hose Replacement.
11. Remove the fuel line.
12. Disconnect the fuel-fired heater electrical harness.
13. Remove two screws from the fuel-fired heater mounting bracket.
14. Remove the fuel-fired heater.

Install or Connect (Figures 34 through 36)

1. Install the fuel-fired heater to crossmember with the mounting bracket and two screws.

   Tighten

   - Tighten fuel-fired heater mounting screws to 10 N.m (88 lb in).
2. Install the fuel line and clamp.

   Tighten

   - Tighten hose clamp to 1.mn (9 lb in).
3. Connect the fuel-fired heater electrical harness.
4. Install the air inlet hose and clamp to the fuel-fired heater. Refer to Fuel-Fired Heater Air Inlet Hose Replacement.
5. Install the outlet hose and clamp to the fuel-fired heater. Refer to Fuel-Fired Heater Outlet Hose Replacement.
6. Install the inlet hose and clamp to the fuel-fired heater. Refer to Fuel-Fired Heater Inlet Hose Replacement.
7. Install two bolts securing the crossmember to the right frame rail.

   Tighten

   - Tighten crossmember mounting screws to 54 N.m (40 lb ft).

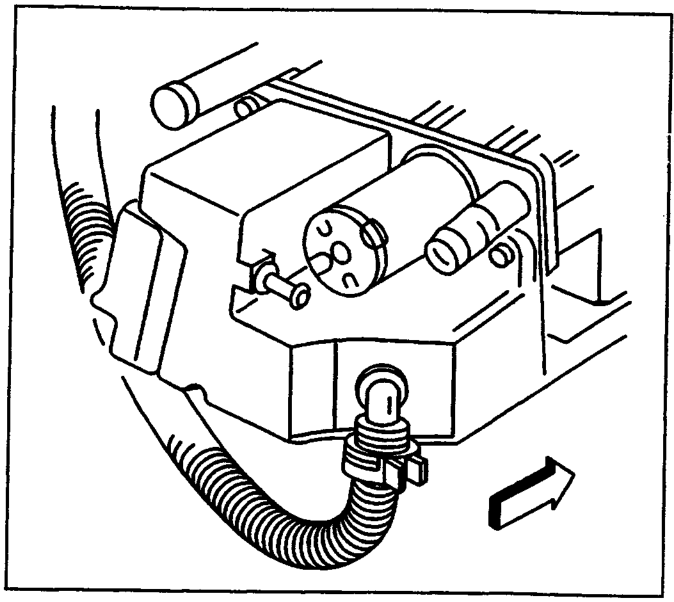


Figure 36—Air Inlet Hose to Heater Connection

8. Tighten two bolts securing the crossmember to the left frame rail.

   Tighten

   - Tighten crossmember mounting screws to 54 N.m (40 lb ft).
9. Install the exhaust pipe. Refer to Exhaust Pipe Replacement in this section.
10. Install the exhaust pipe heat shield. Refer to Exhaust Pipe Heat Shield Replacement in this section.
11. Install the skid plate. Refer to Sheet Metal and Fiberglass.
12. Lower the vehicle on the hoist.
13. Fill the coolant system. Refer to Filling the Coolant System in this section.
14. Install the high-voltage disconnect. Refer to Battery Pack Controls.

FUEL-FIRED HEATER RELAY REPLACEMENT

Remove or Disconnect

1. Open the hood.
2. Remove the cover from the underhood bus electrical relay center.
3. Remove the fuel-fired heater relay from the underhood bus electrical relay center.

Install or Connect

1. Install the fuel-fired heater relay in the underhood bus electrical relay center.
2. Install the cover from underhood bus electrical relay center.

FUEL-FIRED HEATER AIR INLET HOSE REPLACEMENT

Remove or Disconnect (Figures 36 and 37)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove air inlet hose and clamp from cowl panel.
3. Remove the cable strap from the hose
4. Raise the vehicle on the hoist.
5. Remove the skid plate. Refer to Sheet Metal and Fiberglass.
6. Remove the hose from the fuel-fired heater.

Install or Connect (Figures 36 and 37)

1. Install the hose and clamp to the fuel-fired heater.

Tighten

- Tighten hose clamp to 2.mn (18 lb in).

2. Install the skid plate. Refer to Sheet Metal and Fiberglass.
3. Lower the vehicle on the hoist.
4. Install the air inlet hose and hose clamp to the cowl panel.
5. Double hose over and install cable strap.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.

FUEL-FIRED HEATER FUEL TANK REPLACEMENT

Remove or Disconnect (Figure 38)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Raise the vehicle on the hoist.
3. Remove the skid plate. Refer to Sheet Metal and Fiberglass.

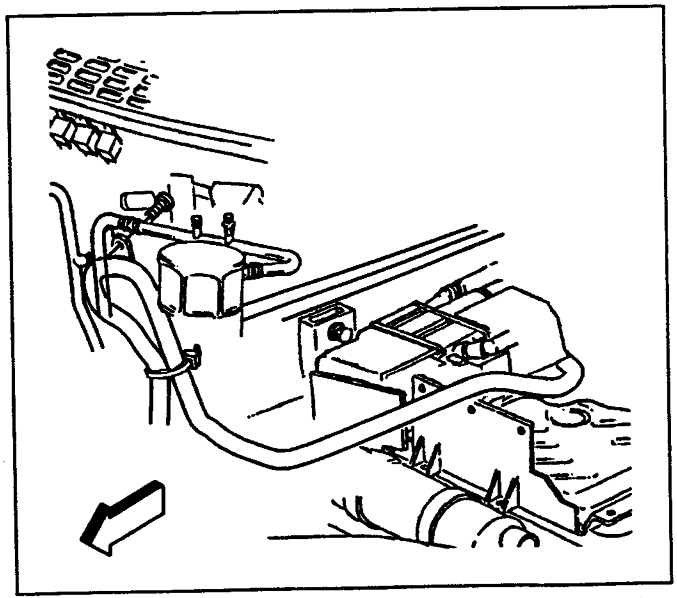


Figure 37—Fuel-Fired Heater Air Inlet Hose Routing

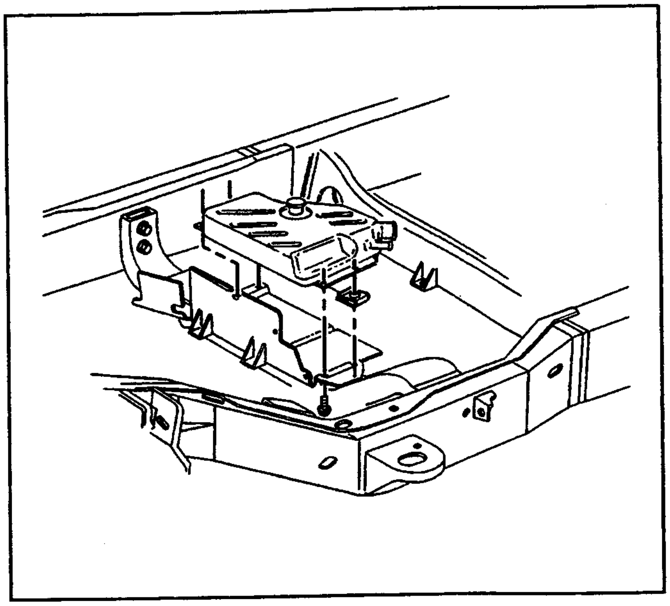


Figure 38—Fuel-Fired Heater Air Inlet Hose Routing

4. Loosen the Battery Thermal Module mounting bolts. Refer to Battery Thermal Module (BTM) Replacement in this section.
5. Remove the exhaust pipe heat shield. Refer to Exhaust Pipe Heat Shield Replacement in this section.
6. Remove the exhaust pipe. Refer to Exhaust Pipe Replacement in this section.
7. Remove the fuel-fired heater inlet hose and clamp from the fuel-fired heater.
8. Remove the fuel-fired heater outlet hose and clamp from the fuel-fired heater.
9. Remove the air inlet hose and clamp from the fuel-fired heater.
10. Remove the two bolts securing cross member to right frame rail.
11. Disconnect the fuel-fired heater electrical harness.
12. Disconnect the fuel-fired heater fuel hose from the tank.
13. Drain the fuel into a clean pan.
14. Disconnect electrical connectors.
15. Remove the filler tube and vent from the tank.
16. Remove four screws from the fuel tank mounting bracket. 17 Remove the fuel tank.

Install or Connect (Figure 38)

1. Position the fuel tank on the mounting bracket.
2. Install the tank to the mounting bracket with four screws.

Tighten

- Tighten screws to 25 N.m (18 lb ft).

3. Install the filler tube and vent to the fuel tank.

Tighten

- Tighten filler tube and vent clamps to 2.5 N.m (22 lb in).

4. Connect electrical connections.
5. Install the fuel-fired heater fuel hose to the tank.

Tighten

- Tighten fuel-fired heater tank hose clamp to 1 N.m (9 lb in).

6. Connect the fuel-fired heater electrical harness.
7. Install the crossmember to the right frame rail with two bolts.

Tighten

- Tighten fuel-fired heater/tank frame crossmember bolts to 54 N.m (40 lb ft).

8. Install the air inlet hose and clamp to the fuel-fired heater.
9. Install the fuel-fired heater outlet hose and clamp to the fuel-fired heater.
10. Install the fuel-fired heater inlet hose and clamp to the fuel-fired heater.
11. Install the exhaust pipe. Refer to Exhaust Pipe Replacement in this section.
12. Install the exhaust pipe heat shield. Refer to Exhaust Pipe Heat Shield Replacement in this section.
13. Tighten the Battery Thermal Module (BTM) mounting bolts. Refer to Battery Thermal Module (BTM) Replacement in this section.
14. Install the skid plate. Refer to Sheet Metal and Fiberglass.
15. Lower the vehicle on the hoist.
16. Fill the coolant system. Refer to Draining and Filling the Coolant System in this section.
17. Install the high-voltage disconnect. Refer to Battery Pack Controls.

FUEL SENSOR REPLACEMENT

Remove or Disconnect

1. Remove the fuel.
2. Raise the vehicle on the hoist.
3. Remove the fuel tank. Refer to Fuel-Fired Heater Fuel Tank Replacement in this section
4. Disconnect the electrical connector.
5. Remove the fuel sensor.

Install or Connect

1. Install the fuel sensor to the fuel tank.

Tighten

- Tighten the fuel sensor to 2 N.m (17 lb in).

2. Connect the electrical connector.
3. Install the fuel tank. Refer to Fuel-Fired Heater Fuel Tank Replacement in this section.
4. Lower the vehicle on the hoist.
5. Fill the fuel tank.

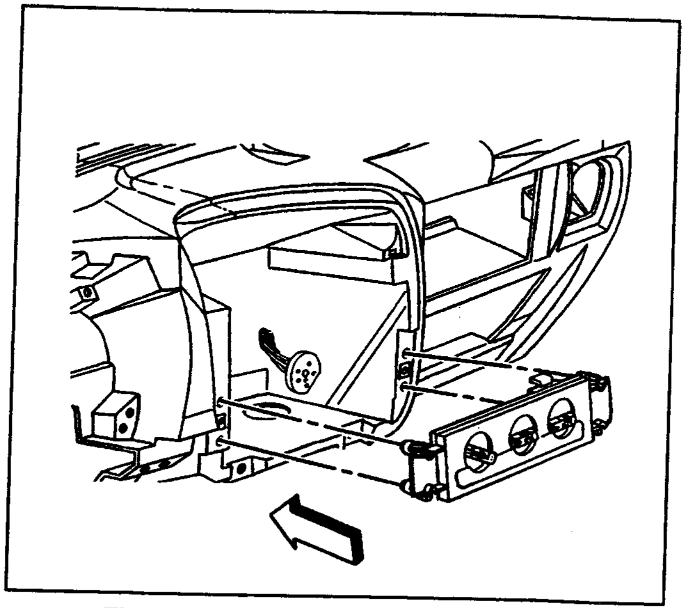


Figure 39—Heater Control Assembly

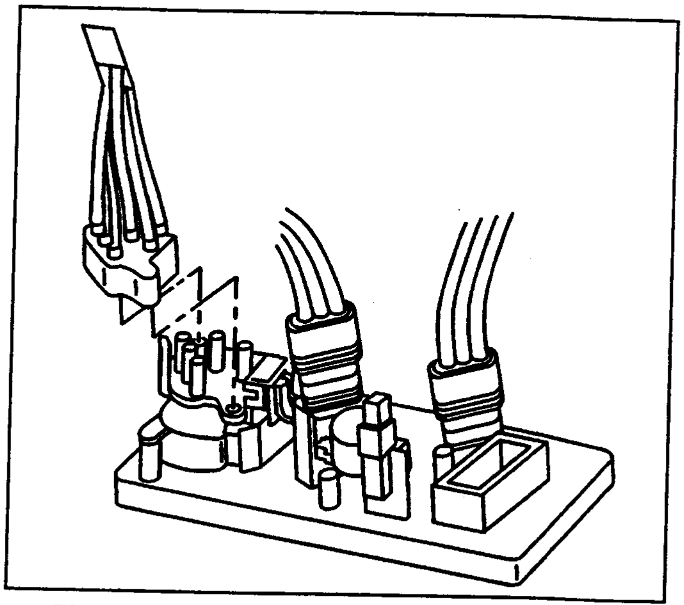


Figure 40—Vacuum Harness to Rotary Valve

CONTROL ASSEMBLY AND BLOWER SWITCH

Remove or Disconnect (Figures 39 through 41)

1. Remove the instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.
2. Remove the control assembly.
3. Disconnect vacuum connectors, as necessary.
4. Disconnect electrical connectors, as necessary.

Install or Connect (Figures 39 through 41)

1. Connect electrical connectors, as necessary.
2. Connect vacuum connectors, as necessary.

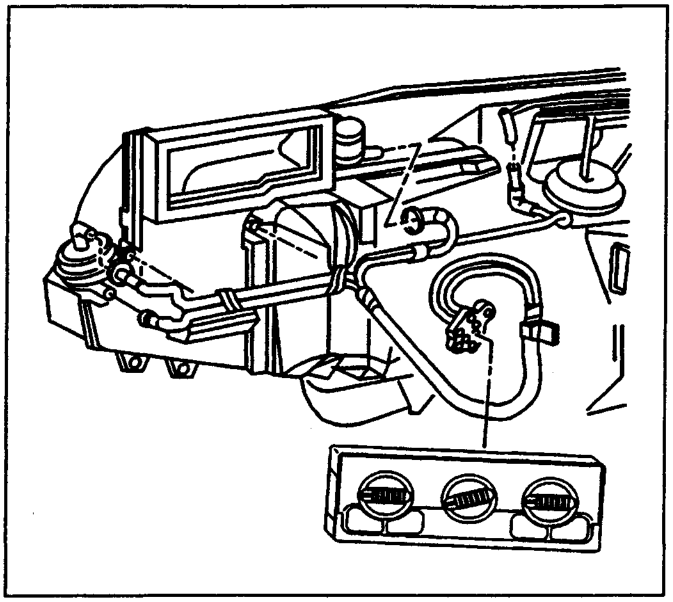


Figure 41—Vacuum Harness Routing

3. Install control assembly.

Tighten

- Tighten the control assembly mounting screws to 1.9 N.m (17 lb in).

4. Install instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.

CONTROL ASSEMBLY LAMP BULB

Remove or Disconnect

1. Remove the heater control assembly. Refer to Control Assembly and Blower Switch in this section.
   - Pull the heater control assembly out far enough to reach the control assembly lamp bulb socket.
2. Remove the lamp bulb and socket.
3. Remove the lamp bulb from the socket.
   - Pull the lamp bulb straight out from the socket.

Inspect

- Control assembly lamp bulb socket for corrosion and damage. Clean or replace as necessary.
- Wires for damage and secure connection to the lamp bulb socket. Repair or replace as necessary.

Install or Connect

1. Install a new lamp bulb.
   - Push the lamp bulb straight into the socket.
2. Install lamp bulb and socket.
3. Install the heater control assembly. Refer to Control Assembly and Blower Switch in this section.
   - Perform the Heater Function Test.

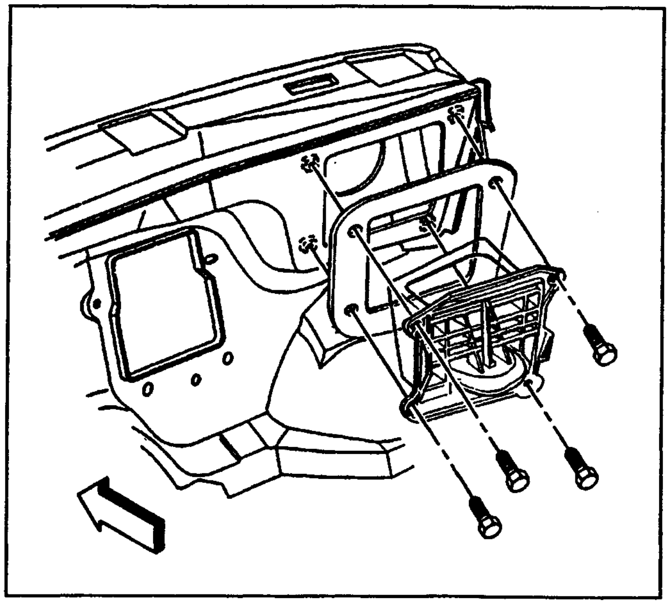


Figure 42—Air Inlet Assembly

AIR INLET ASSEMBLY

Remove or Disconnect (Figure 42)

1. Remove the instrument panel. Refer to Instrument Panel Replacement in Interior Trim.
2. Disconnect vacuum connectors, as necessary.
3. Remove the air inlet studs.
4. Remove the air inlet assembly.
5. Remove the air inlet gasket, if necessary.

Install or Connect (Figure 42)

1. Install the air inlet gasket, if necessary.
2. Install the air inlet assembly.
3. Install the air inlet studs.

Tighten

- Tighten air inlet studs to 4.5 .Nm (40 lb in).

4. Connect vacuum connectors, as necessary.
5. Install the instrument panel. Refer to Instrument Panel Replacement in Interior Trim.

BLOWER MOTOR RESISTOR

Remove or Disconnect (Figure 43)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Disconnect the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
3. Disconnect the electrical connector.
4. Remove the blower motor resistor mounting screws.
5. Remove the blower motor resistor.

Install or Connect (Figure 43)

1. Install the blower motor resistor.

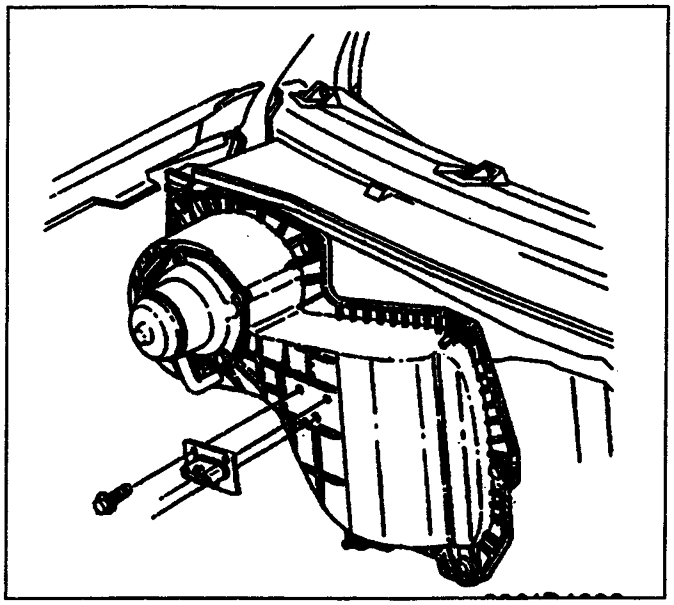


Figure 43—Blower Motor Resistor

2. Install the blower motor resistor mounting screws.

Tighten

- Tighten blower motor resister mounting screws to 1.9 .Nm (17 lb in).

3. Connect the electrical connector.
4. Connect the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
5. Install the high-voltage disconnect. Refer to Battery Pack Controls.
6. Perform heater function test. Refer to Heater Function Test in this section.

BLOWER MOTOR AND FAN

Remove or Disconnect

1. Remove the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Remove the BPCM or BCIM. Refer to Drive Motor Controls.
3. Remove the coolant reservoir. Refer to Radiator Coolant Reservoir Replacement in Propulsion System Cooling.
4. Remove the cooling tube.
5. Disconnect electrical connectors, as necessary.
6. Remove blower motor and fan assembly mounting screws.
7. Remove blower motor and fan assembly.
8. Pull hose away from evaporator core.

Install or Connect

1. Install hose to evaporator core.
2. Install blower motor and fan assembly.
3. Install motor and fan assembly mounting screws until fully seated, secured, and not stripped.
4. Connect electrical connectors.
5. Install cooling tube.
6. Install coolant reservoir. Refer to Radiator Coolant Reservoir Replacement in Propulsion System Cooling.

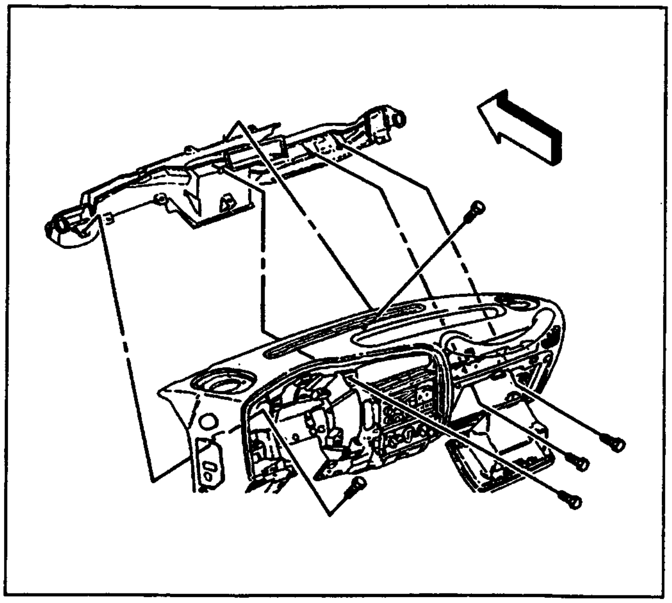


Figure 44—Air Distributor Duct

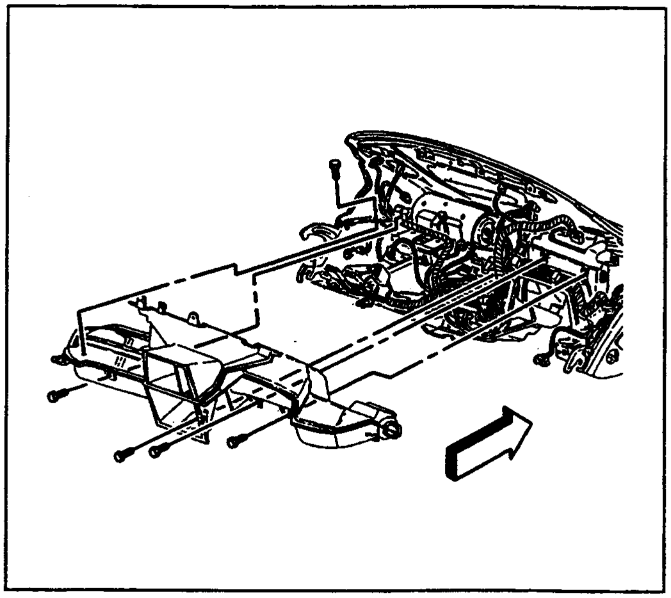


Figure 45—Air Distributor Duct

7. Install the BPCM or BCIM. Refer to Drive Motor Controls.
8. Install the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
9. Perform heater function test. Refer to Heater Function Test in this section.

AIR DISTRIBUTOR DUCT

Remove or Disconnect (Figures 44 and 45)

1. Remove the instrument panel. Refer to Instrument Panel Replacement in Interior Trim.
2. Remove the air distributor duct mounting screws.
3. Remove the air distributor duct.

Install or Connect (Figures 44 and 45)

1. Install the air distributor duct.

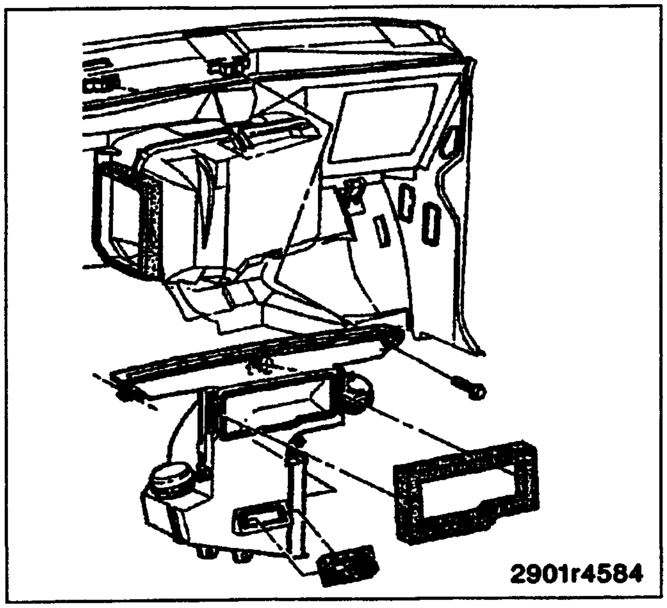


Figure 46—Windshield Defroster Nozzle

2. Install the air distributor duct mounting screws.

Tighten

- Tighten the air distributor duct mounting screws to 1.9 .Nm (17 lb in).

3. Install the instrument panel. Refer to Instrument Panel Replacement in Interior Trim.

WINDSHIELD DEFROSTER NOZZLE

Remove or Disconnect (Figure 46)

1. Remove the instrument panel. Refer to Instrument Panel and Gauges.
2. Disconnect the vacuum connectors, as necessary.
3. Remove the windshield defroster nozzle mounting screws.
4. Remove the windshield defroster nozzle from heater assembly.

Install or Connect (Figure 46)

1. Install the windshield defroster nozzle to heater assembly.
2. Install the windshield defroster nozzle mounting screws.

Tighten

- Tighten the windshield defroster nozzle mounting screws to 2 N.m (18 lb in).

3. Connect the vacuum connectors, as necessary.
4. Install the instrument panel. Refer to Refer to Instrument Panel and Gauges.

FLOOR AIR OUTLET

Remove or Disconnect (Figure 47)

1. Remove the floor air outlet mounting screws.
2. Remove the floor air outlet.

Install or Connect (Figure 47)

1. Install the floor air outlet.
2. Install the floor air outlet mounting screws.

Tighten

- Tighten the floor air outlet mounting screws to 3.1 N.m (27 lb in).

VACUUM TANK

Remove or Disconnect (Figures 48 and 49)

1. Remove vacuum hose(s).
2. Remove the ABS module bolts.
3. Remove the vacuum tank.

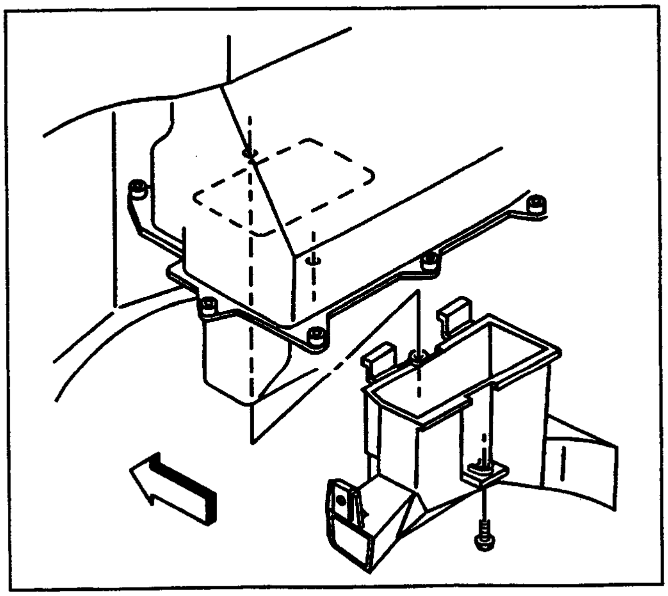


Figure 47—Floor Air Outlet

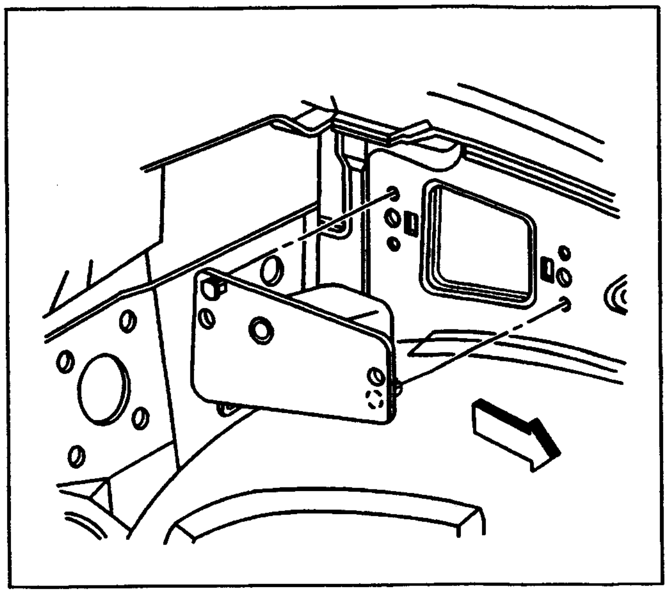


Figure 48—Vacuum Tank

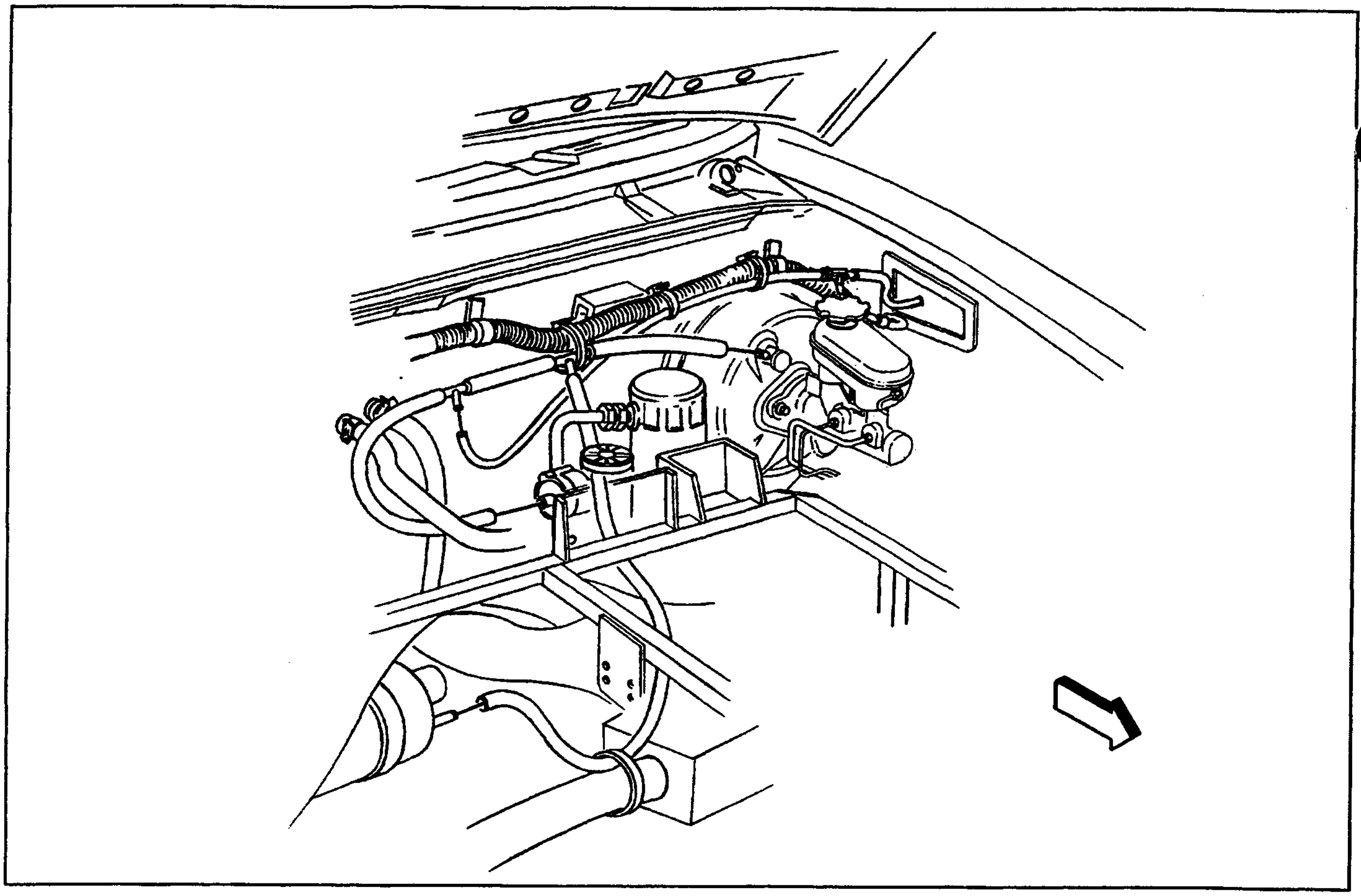


Figure 49—Vacuum Hose Routing

Install or Connect (Figures 48 and 49)

1. Install the vacuum tank.
2. Install the ABS module bolts.
3. Install vacuum hose(s).

TEMPERATURE VALVE ACTUATOR

The temperature valve actuator is located on the front of the heater case.

Remove or Disconnect

1. Remove the instrument panel storage compartment. Refer to Instrument Panel and Gauges.
2. Disconnect the electrical connector.
3. Remove the screws.
4. Remove the temperature valve actuator.

Install or Connect

1. Install the temperature valve actuator.
2. Install the screws.
3. Connect the electrical connector.
4. Install the instrument panel storage compartment. Refer to Instrument Panel and Gauges.
5. Perform heater function test. Refer to Heater Function Test in this section.

CENTER OUTLET DUCT AND DEFROSTER VALVE VACUUM ACTUATORS

Remove or Disconnect

1. Remove the instrument panel. Refer to Instrument Panel and Gauges.
2. Disconnect the vacuum hose connector at the center outlet duct actuator and/or defroster valve actuator.
   - Disconnect the vacuum hose connector by sliding the tab of the connector past the L-shaped bend in the actuator vacuum tube. Then slide the hose connector off the tube while continuing to hold the tab back against the connector end.
3. Remove the center outlet duct actuator and/or defroster valve actuator, if necessary.
   - Disconnect the linkage from the actuator.

Install or Connect

1. Install the center outlet duct actuator and/or defroster valve actuator, if removed.
   - Connect the linkage to the actuator.
2. Connect the vacuum hose connector(s).
   A. Install the black hose to the center outlet duct actuator and/or the black/tan hose to the defroster valve actuator.

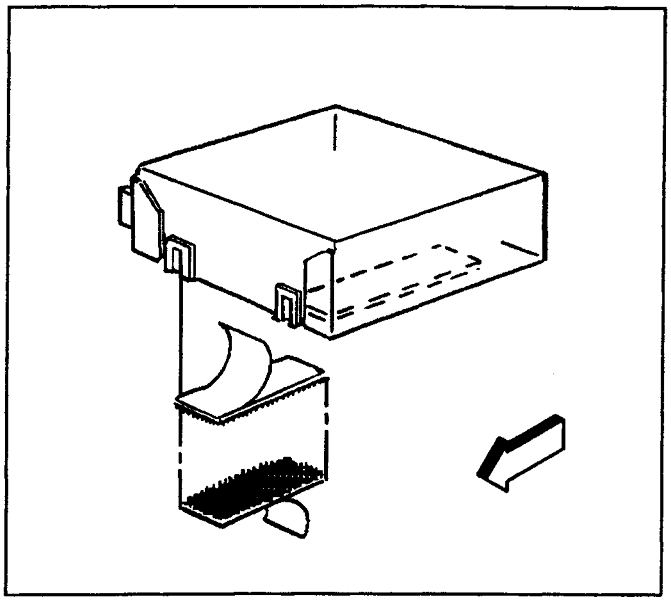


Figure 50—Duo-Lock Application to HTCM

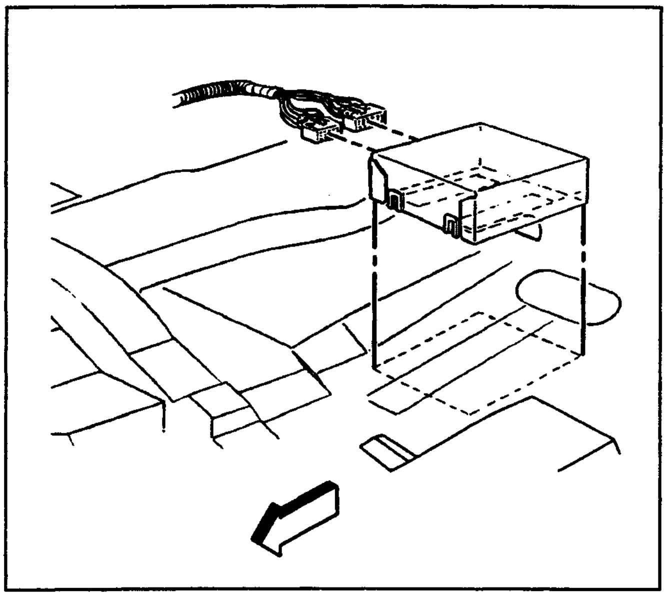


Figure 51—HTCM Installation

B. Connect the vacuum hose connector by bending the tab of the connector back flush against the end of the connector and holding it there while slipping the tab and the connector onto the vacuum actuator tube. When the connector is fully seated, pull the tab over the L-shaped bend in the tube to hold the connector in place.

3. Install the instrument panel. Refer to Instrument Panel and Gauges.

HEATER VENTILATION AIR CONDITIONING THERMAL CONTROL MODULE (HTCM)

←→ Remove or Disconnect (Figures 50 and 51)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the seat. Refer to Seats.

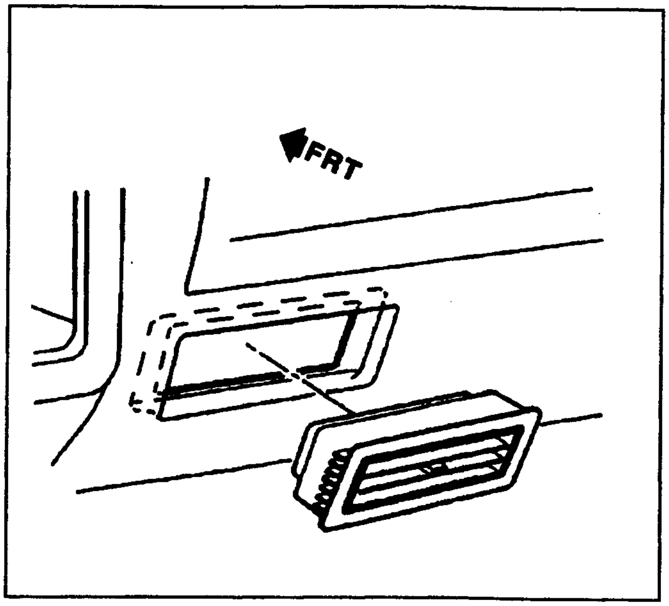


Figure 52—Lap Air Outlet

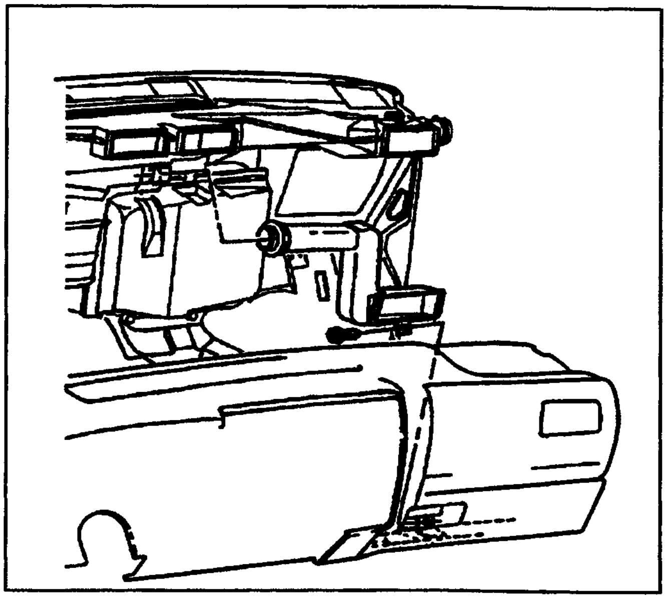


Figure 53—Lap Air Outlet Duct

3. Pull the floor mat back.
4. Disconnect the electrical connectors.
5. Remove the HTCM.

→← Install or Connect (Figures 50 and 51)

1. Install the HTCM.
2. Connect electrical connectors.
3. Install the floor mat.
4. Install the seat. Refer to Seats.
5. Install the high-voltage disconnect. Refer to Battery Pack Controls.

LAP AIR OUTLET DUCT

←→ Remove or Disconnect (Figures 52 and 53)

1. Remove the instrument panel. Refer to Instrument Panel and Gauges.
2. Remove the lap air outlet, if necessary.

3. Remove the lap air outlet screw.
4. Remove the lap air outlet duct from air distributor duct assembly.

Install or Connect (Figures 52 and 53)

1. Install the lap air outlet duct to air distributor duct assembly.
2. Install the lap air outlet screw.

Tighten

- Tighten the lap air outlet screw to 1.9 N.m (17 lb in).

3. Install the lap air outlet, if necessary.
4. Install the instrument panel. Refer to Instrument Panel and Gauges.

HEATER ASSEMBLY

Remove or Disconnect (Figures 54 and 55)

1. Drain coolant. Refer to Draining and Filling the Coolant System in this section.
2. Remove two heater hoses from the core. Refer to Fuel-Fired Heater Outlet Hose Replacement and Reservoir Inlet Hose Replacement in this section.
3. Remove the instrument panel. Refer to Instrument Panel and Gauges.
4. Remove the air inlet assembly. Refer to Air Inlet Assembly Replacement in this section.
5. Disconnect vacuum lines.

Important

- Clearly label vacuum line connections

6. Remove the heater assembly studs inside engine bay.

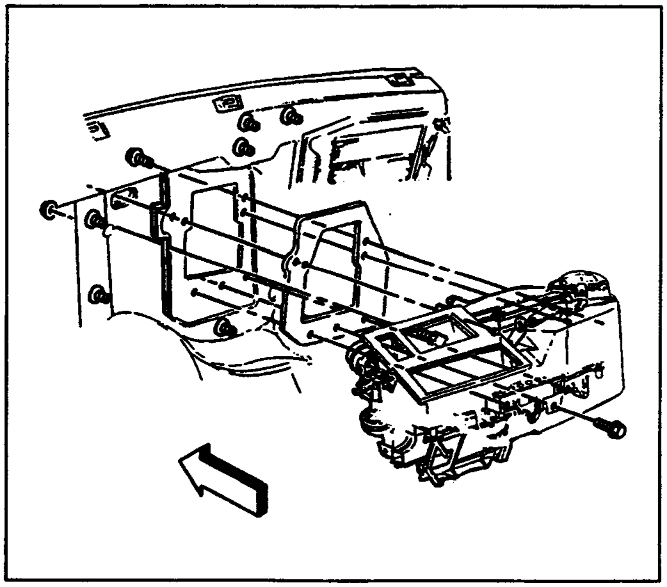


Figure 54 - Heater Assembly

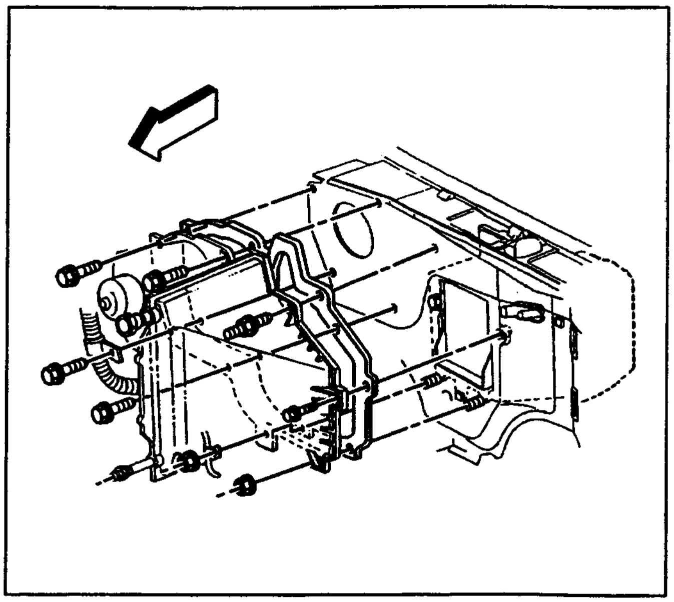


Figure 55 - Evaporator Core Assembly

7. Remove the blower motor resistor. Refer to Blower Motor Resistor in this section.
8. Remove the stud inside the heater core housing.
   - Stud is revealed by removing the blower motor resistor.
9. Remove the rear case screws.
10. Remove the heater assembly.
11. Remove the seals.

Install or Connect (Figures 54 and 55)

1. Install the seals.
2. Install the heater assembly.
3. Install the rear case screws.
4. Install the stud inside heater core housing.

Tighten

- Stud to 1.9 N.m (17 lb in)

5. Blower motor resistor. Refer to Blower Motor Resistor in this section.
6. Install the heater assembly studs inside engine bay.

Tighten

- Studs to 1.9 N.m (17 lb in)

7. Connect vacuum lines.
8. Install the air inlet assembly. Refer to Air Inlet Assembly in this section.
9. Install the instrument panel. Refer to Instrument Panel and Gauges.
10. Install two heater hoses. Refer to Fuel-Fired Heater Outlet Hose Replacement and Reservoir Inlet Hose Replacement in this section.
11. Refill coolant. Refer to Draining and Filling the Coolant System in this section.
    - Check the system for leaks.

COMPRESSOR

↔ Remove or Disconnect (Figures 56 through 60)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Disconnect the electrical connector on compressor pigtail.
4. Disconnect the compressor high-voltage cable from APM.
5. Remove clips securing the compressor high-voltage cable to the Power Inverter Module frame.
6. Install compressor to reversing valve hose assembly. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.

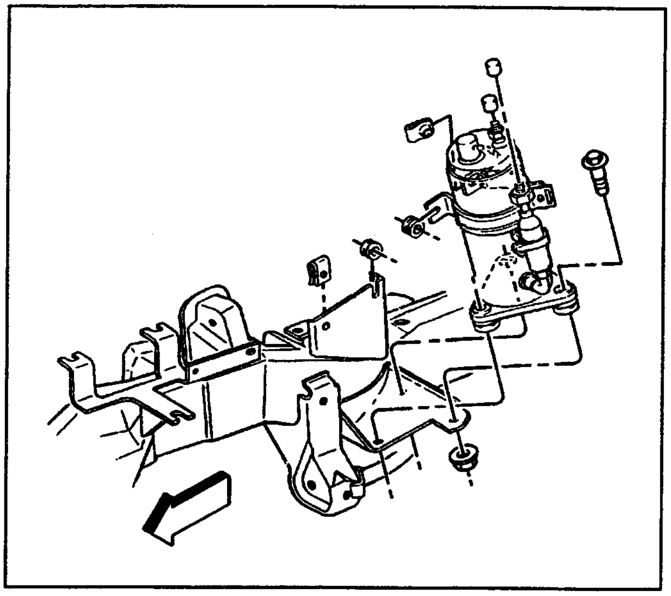


Figure 56 - Compressor Installation to Frame Mounting Bracket

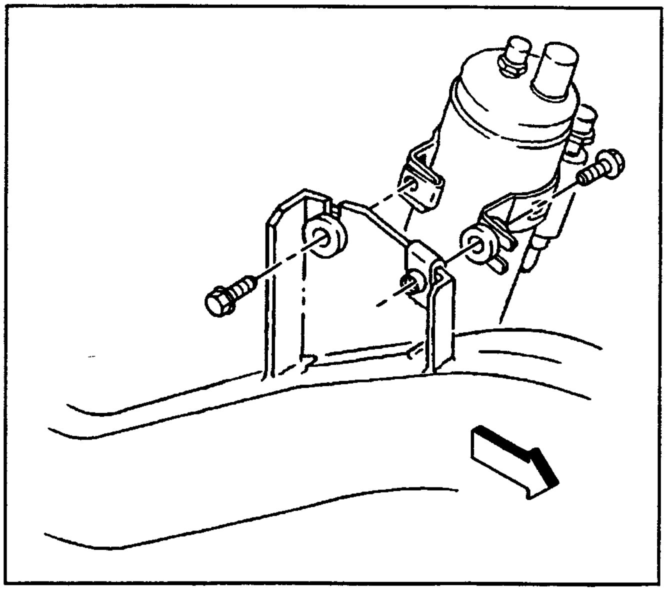


Figure 57 - Upper Compressor Mounting Bracket

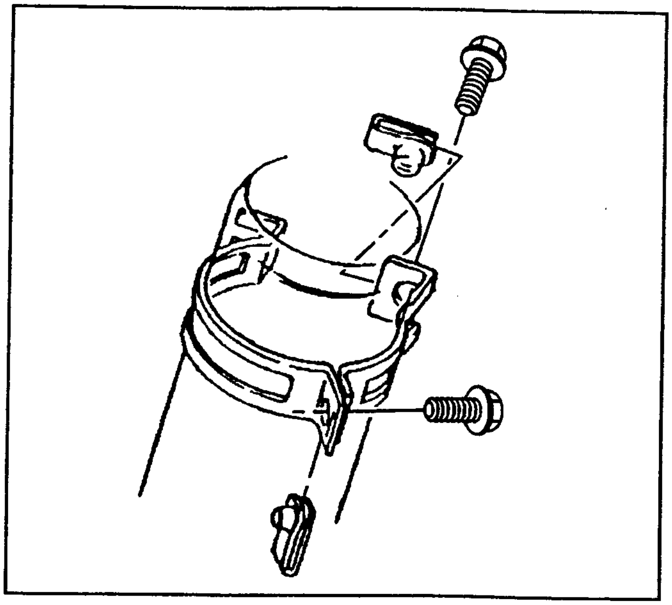


Figure 58 - Upper Compressor Mounting Bracket Screw

7. Remove compressor to condenser hose. Refer to Compressor and Condenser Hose Assembly in this section.
8. Remove screw from upper compressor mounting bracket.
9. Remove two mounting bolts and rubber insulators from upper compressor mounting bracket.
10. Remove three compressor mounting bolts and rubber insulators from the frame mounting bracket.
11. Remove the compressor.

→← Install or Connect (Figures 56 through 60)

1. Install the compressor to the frame mounting bracket with three rubber insulators, bolts, and nuts.

   Tighten

   - Tighten compressor bolts to 1.5 N.m (13 lb in) plus an additional 6.5 revolutions.
2. Install upper mounting bracket to frame with two rubber insulators, bolts, and nuts.

   Tighten

   - Tighten upper mounting bracket bolt to 6 N.m (53 lb in).
3. Install bolt and nut in upper mounting bracket.

   Tighten

   - Tighten upper mounting bracket bolt to 6 N.m (53 lb in).
4. Install compressor to reversing valve hose assembly. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.
5. Install compressor to condenser hose assembly. Refer to Compressor and Condenser Hose Assembly in this section.
6. Connect the electrical connector on compressor pigtail.

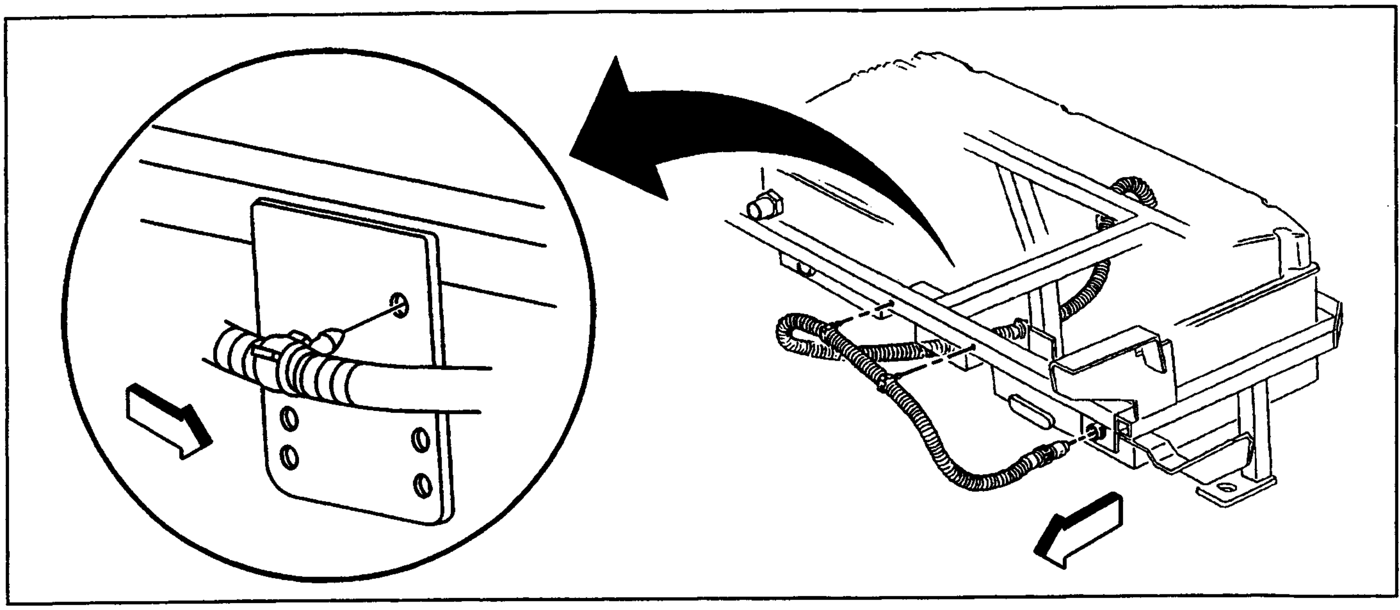


Figure 59 - Compressor Cable Routing

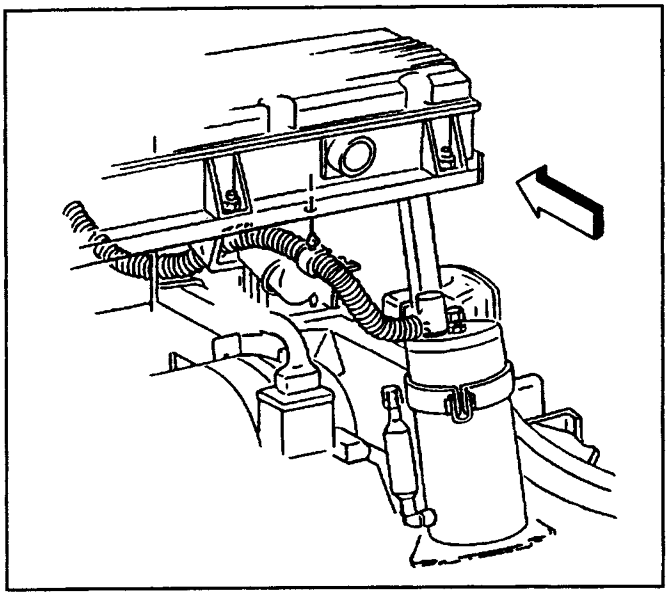


Figure 60 - Compressor Cable Installation

7. Route the compressor high-voltage cable under the PIM frame.
8. Connect the compressor high-voltage cable to the APM.
9. Install the high-voltage disconnect. Refer to Battery Pack Controls.
10. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

REVERSING VALVE TO COMPRESSOR REFRIGERANT HOSE REPLACEMENT

↔ Remove or Disconnect (Figure 61)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.

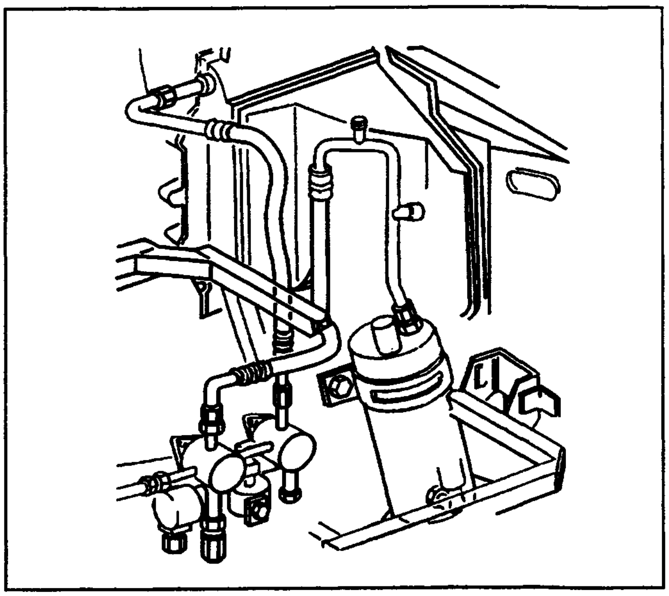


Figure 61—Refrigerant Hoses from Reversing Valve to Compressor and Evaporator

2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the Power Inverter Module. Refer to Drive Motor Controls.
4. Disconnect the reversing valve electrical lead.
5. Remove the refrigerant line from the top front of the reversing valve.
6. Remove the refrigerant line from the top of the compressor.
    - Cap or plug all open connections.
7. Remove the O-ring seals from the line.

→← Install or Connect (Figure 61)

1. Install new O-ring seals on refrigerant line.
    - Coat O-ring seals with 525 viscosity refrigerant oil.

2. Install the refrigerant line to the top of the compressor.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

3. Install the refrigerant line to the top front of the reversing valve.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

4. Connect the reversing valve electrical lead.
5. Install the Power Inverter Module. Refer to Drive Motor Controls.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

EVAPORATOR TO REVERSING VALVE REFRIGERANT HOSE REPLACEMENT

Remove or Disconnect (Figure 61)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the Power Inverter Module. Refer to Drive Motor Controls.
4. Disconnect the reversing valve electrical lead.
5. Remove the refrigerant line from the top rear of the reversing valve.
6. Remove the refrigerant line from the evaporator.
   - Cap or plug all open connections.
7. Remove the O-ring seals from the line.

Install or Connect (Figure 61)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the refrigerant line to the evaporator.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

3. Install the refrigerant line to the top rear of the reversing valve.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

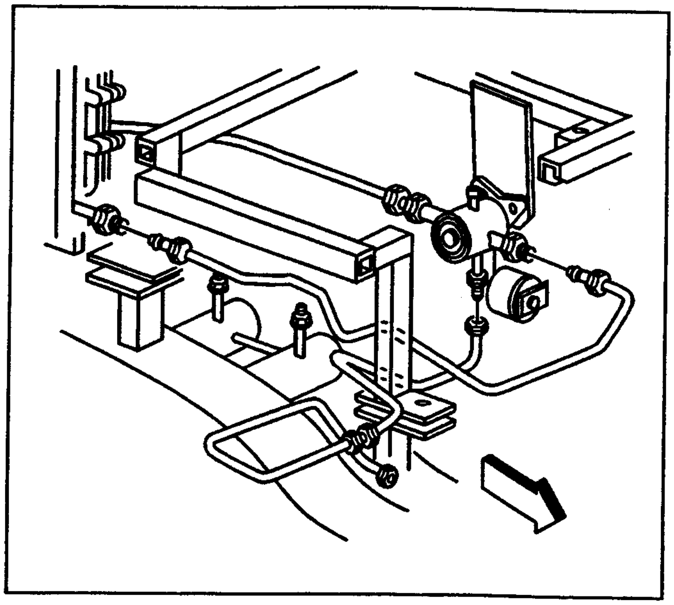


Figure 62—Evaporator Tube to 5-Way Valve Installation

4. Connect the reversing valve electrical lead.
5. Install the Power Inverter Module. Refer to Drive Motor Controls.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

FIVE-WAY VALVE TO EVAPORATOR REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figure 62)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the 5-way valve electrical lead.
5. Remove the evaporator line from the rear of the 5-way valve assembly.
6. Remove the evaporator line from the evaporator and BTM.
7. Remove the O-ring seals from the line.

Install or Connect (Figure 62)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.

2. Install the evaporator line to the evaporator and BTM.

Tighten

   - Tighten the evaporator line nut to 25 N.m (18 lbs ft).

3. Install the evaporator line to the rear of the 5-way valve assembly.

Tighten

   - Tighten the evaporator line nut to 25 N.m (18 lbs ft).

4. Connect the 5-way valve electrical lead.
5. Install the Power Inverter Module. Refer to Drive Motor Controls.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

FIVE-WAY VALVE TO CONDENSER REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figure 63)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the 5-way valve electrical lead.
5. Remove the A/C condenser line from the bottom of the 5-way valve assembly.
6. Remove the A/C condenser line from the A/C condenser.
7. Remove the O-ring seals from the line.

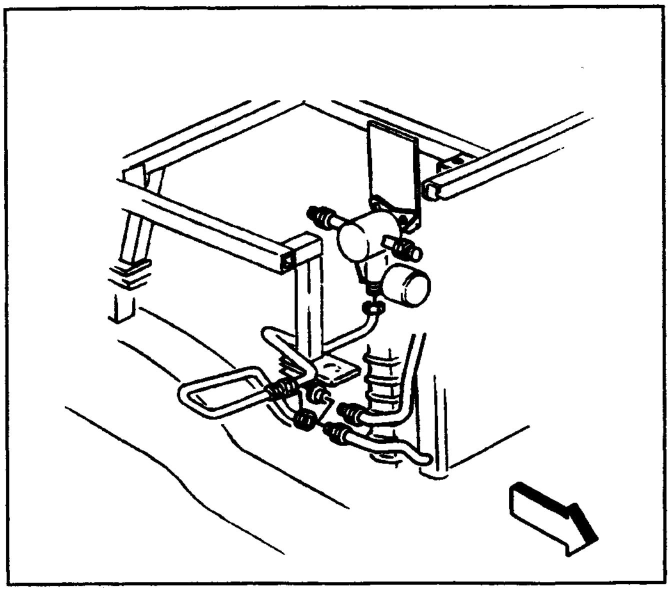


Figure 63—A/C Condenser Tube to 5-Way Valve Installation

Install or Connect (Figure 63)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the A/C condenser line to the A/C condenser.

Tighten

   - Tighten the condenser line nut to 25 N.m (18 lbs ft).

3. Install the A/C condenser line to the bottom of the 5-way valve assembly.

Tighten

   - Tighten the condenser line nut to 25 N.m (18 lbs ft).

4. Connect the 5-way valve electrical lead.
5. Install the Power Inverter Module. Refer to Drive Motor Controls.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

REVERSING VALVE TO CONDENSER REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figures 64 and 65)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the reversing valve electrical lead.
5. Remove the refrigerant line from the front of the reversing valve.
6. Remove the refrigerant line from the condenser.
7. Remove the O-ring seals from the line.

Install or Connect (Figures 64 and 65)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.

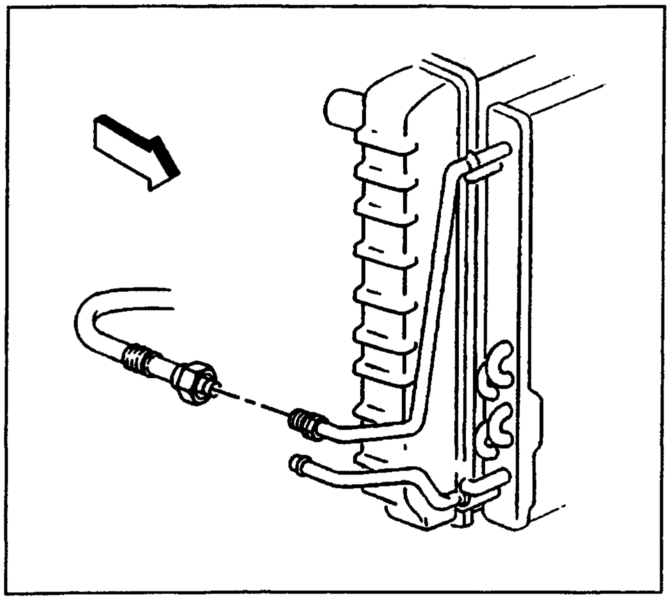


Figure 64—Reversing Valve Refrigerant Line to Condenser

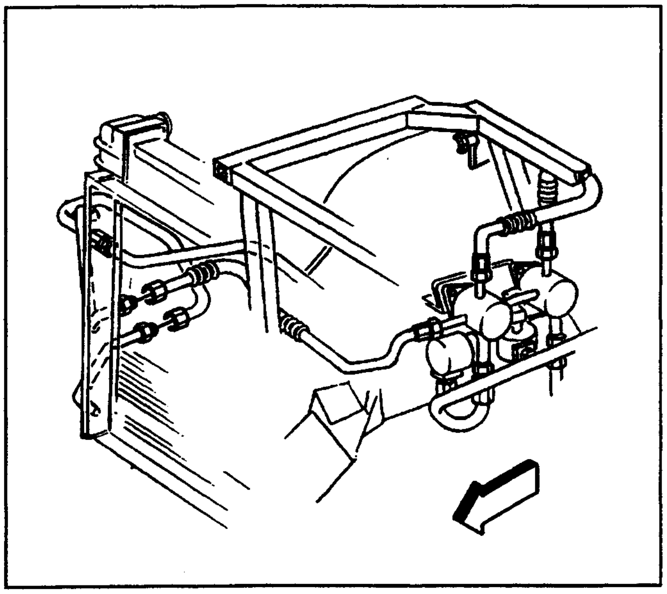


Figure 65—Refrigerant Line to Condenser and Reversing Valve

2. Install the refrigerant line to the condenser.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

3. Install the refrigerant line to the front of the reversing valve.

Tighten

- Tighten the refrigerant line nut to 25 N.m (18 lbs ft).

4. Connect the reversing valve electrical lead.
5. Install the Power Inverter Module. Refer to Drive Motor Controls.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

ACCUMULATOR TO COMPRESSOR REFRIGERANT HOSE REPLACEMENT

Remove or Disconnect (Figure 66)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the refrigerant line from the accumulator.
4. Remove the refrigerant line from the compressor.
5. Remove the O-ring seals from the line.

Install or Connect (Figure 66)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the refrigerant line assembly to the accumulator.

Tighten

- Tighten the line nut to 45 N.m (33 lb ft).

3. Install the refrigerant line assembly to the compressor.

Tighten

- Tighten the line nut to 25 N.m (18 lb ft).

4. Install the high-voltage disconnect. Refer to Battery Pack Controls.

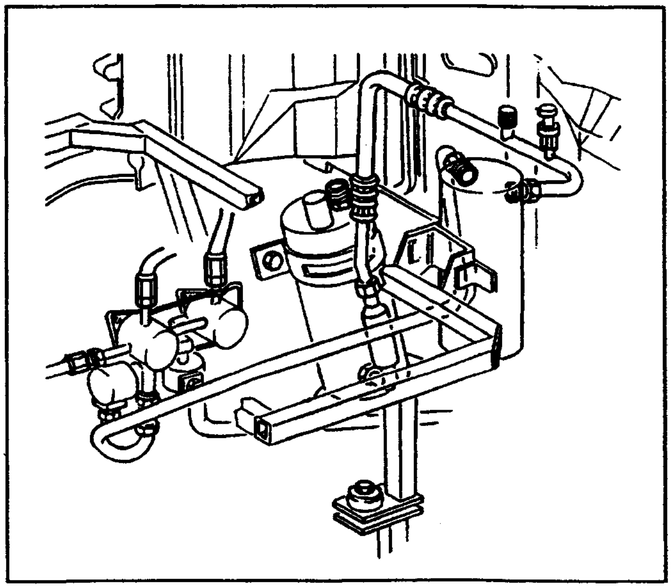


Figure 66—Accumulator Refrigerant Lines

5. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

REVERSING VALVE TO ACCUMULATOR REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figure 66)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the Power Inverter Module (PIM). Refer to Drive Motor Controls.
4. Remove the refrigerant line from the accumulator.
5. Remove the refrigerant line from the reversing valve.
6. Remove the O-ring seals from the line.

Install or Connect (Figure 66)

1. Install new O-ring seals on refrigerant line.
    - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the refrigerant line assembly to the accumulator.

Tighten

- Tighten the line nut to 45 N.m (33 lb ft).

3. Install the refrigerant line assembly to the reversing valve.

Tighten

- Tighten the line nut to 25 N.m (18 lb ft).

4. Install the Power Inverter Module (PIM). Refer to Drive Motor Controls.
5. Install the high-voltage disconnect. Refer to Battery Pack Controls.
6. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

REVERSING VALVE TO BATTERY THERMAL MODULE (BTM) REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figure 67)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.

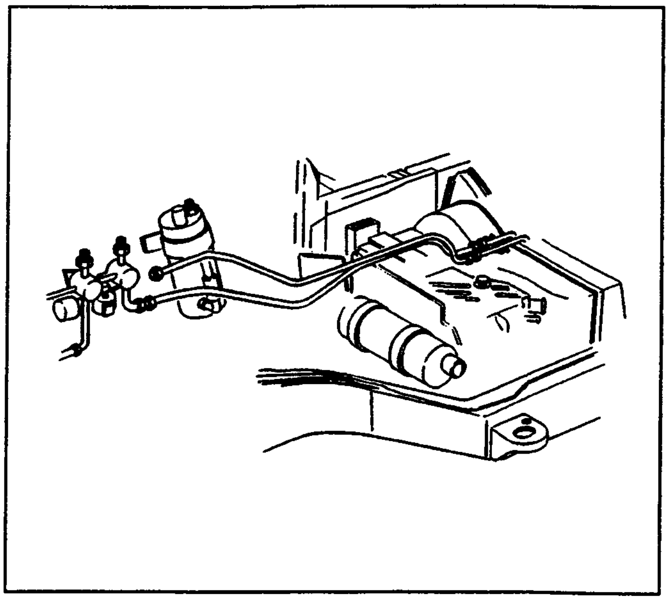


Figure 67—BTM to Reversing Valve Refrigerant Line

3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the reversing valve electrical lead.
5. Remove the BTM line from the lower rear of the reversing valve.
6. Raise vehicle on hoist.
7. Remove the skid plate. Refer to Sheet Metal and Fiberglass.
8. Remove the refrigerant line from the BTM.
9. Remove the O-ring seals from the line.

Install or Connect (Figure 67)

1. Install new O-ring seals on refrigerant line.
    - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the refrigerant line to the BTM.

Tighten

- Tighten the BTM line nut to 25 N.m (18 lbs ft).

3. Install the skid plate. Refer to Sheet Metal and Fiberglass.
4. Lower vehicle on hoist.
5. Install the BTM line to the lower rear of the reversing valve.

Tighten

- Tighten the BTM line nut to 25 N.m (18 lbs ft).

6. Connect the reversing valve electrical lead.
7. Install the Power Inverter Module. Refer to Drive Motor Controls.
8. Install the high-voltage disconnect. Refer to Battery Pack Controls.
9. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

FIVE-WAY VALVE TO BATTERY THERMAL MODULE (BTM) REFRIGERANT LINE REPLACEMENT

Remove or Disconnect (Figures 67 and 68)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the 5-way valve electrical lead.
5. Remove the BTM line from the rear of the 5-way valve assembly.
6. Raise vehicle on hoist.
7. Remove the skid plate. Refer to Sheet Metal and Fiberglass.
8. Remove the BTM line from the BTM.
9. Remove the O-ring seals from the line.

Install or Connect (Figures 67 and 68)

1. Install new O-ring seals on refrigerant line.
   - Coat O-ring seals with 525 viscosity refrigerant oil.
2. Install the BTM line to the BTM.

Tighten

- Tighten the BTM line nut to 25 N.m (18 lbs ft).

3. Install the skid plate. Refer to Sheet Metal and Fiberglass.
4. Lower vehicle on hoist.
5. Install the BTM line to the rear of the 5-way valve assembly.

Tighten

- Tighten the BTM line nut to 25 N.m (18 lbs ft).

6. Connect the 5-way valve electrical lead.
7. Install the Power Inverter Module. Refer to Drive Motor Controls.
8. Install the high-voltage disconnect. Refer to Battery Pack Controls.
9. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

REVERSING VALVE REPLACEMENT

Remove or Disconnect (Figures 61, 64, 65, 66, 67, 69, and 70)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the compressor hose from the top front of the valve. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.
5. Remove the bleeder (discharge) line from the top of the 5-way valve assembly.
6. Remove the evaporator line from the top rear of the valve. Refer to Evaporator to Reversing Valve Refrigerant Hose Replacement in this section.

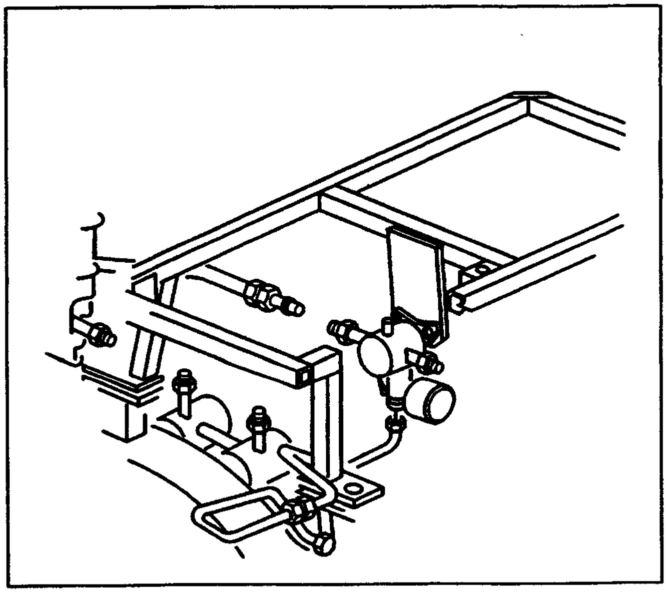


Figure 68—BTM Tube to 5-Way Valve Installation

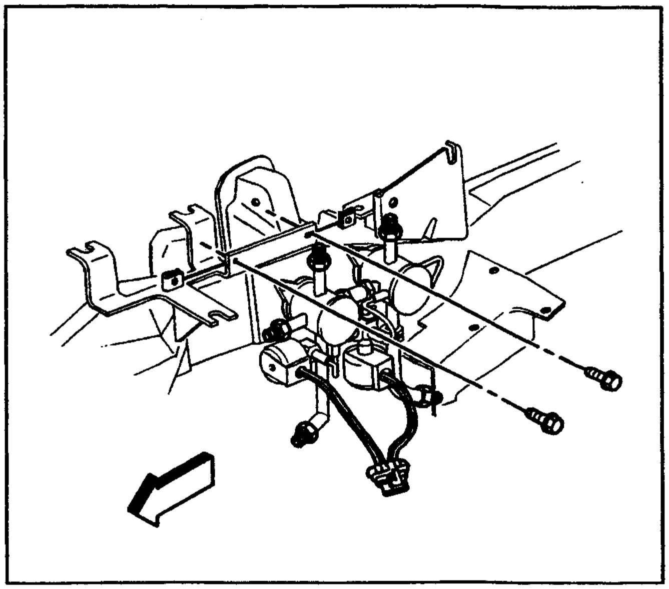


Figure 69—Reversing Valve Installation

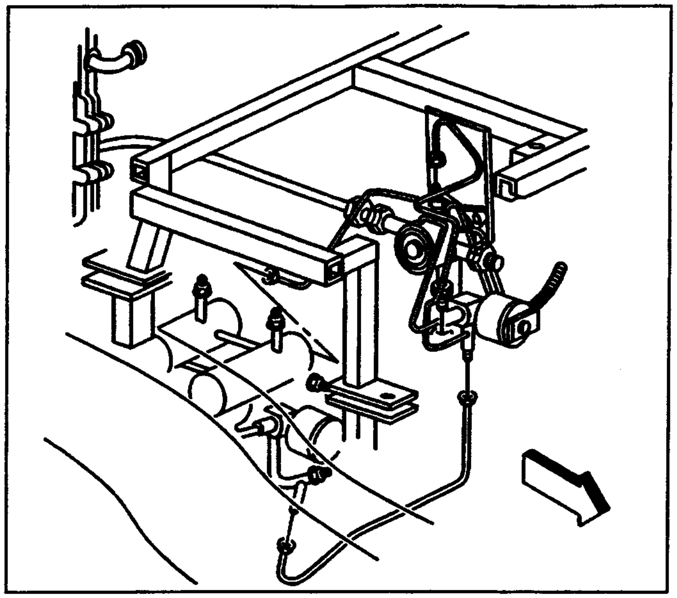


Figure 70—Bleeder Line Connections

7. Remove the condenser line from the front of the valve. Refer to Reversing Valve to Condenser Refrigerant Line Replacement in this section.
8. Remove the accumulator line from the bottom front of the valve. Refer to Reversing Valve to Accumulator Refrigerant Line Replacement in this section.
9. Remove the battery thermal module (BTM) line from the bottom rear of the valve. Refer to Reversing Valve to Battery Thermal Module (BTM) Refrigerant Line Replacement in this section.
10. Remove the bleeder (suction) line from the front bottom of the valve.
11. Disconnect the electrical connector.
12. Remove two mounting bolts from the valve.
13. Remove the reversing valve.

Install or Connect (Figures 61, 64, 65, 66, 67, 69, and 70)

1. Position the reversing valve on the bracket.
2. Install two mounting bolts to the valve.

Tighten

- Tighten the reversing valve mounting bolts to 10 N.m (88 lb in).

3. Connect the electrical connector.
4. Install the battery thermal module line to the bottom rear of the valve. Refer to Reversing Valve to Battery Thermal Module (BTM) Refrigerant Line Replacement in this section.
5. Install new O-ring seals on the bleeder lines (if equipped).
   - Coat O-ring seals with 525 viscosity refrigerant oil.
6. Install the bleeder (suction) line to the bottom of the 5-way valve assembly.

Tighten

- Tighten the bleeder line nut to 12 N.m (106 lbs in).

7. Install the accumulator line to the bottom front of the valve. Refer to Reversing Valve to Accumulator Refrigerant Line Replacement in this section.
8. Install the condenser line to the front of the valve. Refer to Reversing Valve to Condenser Refrigerant Line Replacement in this section.
9. Install the evaporator line to the top rear of the valve. Refer to Evaporator to Reversing Valve Refrigerant Hose Replacement in this section.
10. Install the bleeder (discharge) line to the top of the 5-way valve assembly.

Tighten

- Tighten the bleeder line nut to 12 N.m (106 lbs in).

11. Install the compressor line to the top front of the valve. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.
12. Install the Power Inverter Module. Refer to Drive Motor Controls.
13. Install the high-voltage disconnect. Refer to Battery Pack Controls.
14. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

FIVE-WAY VALVE REPLACEMENT

Remove or Disconnect (Figures 62, 63, 68, 70, and 71)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the Power Inverter Module. Refer to Drive Motor Controls.

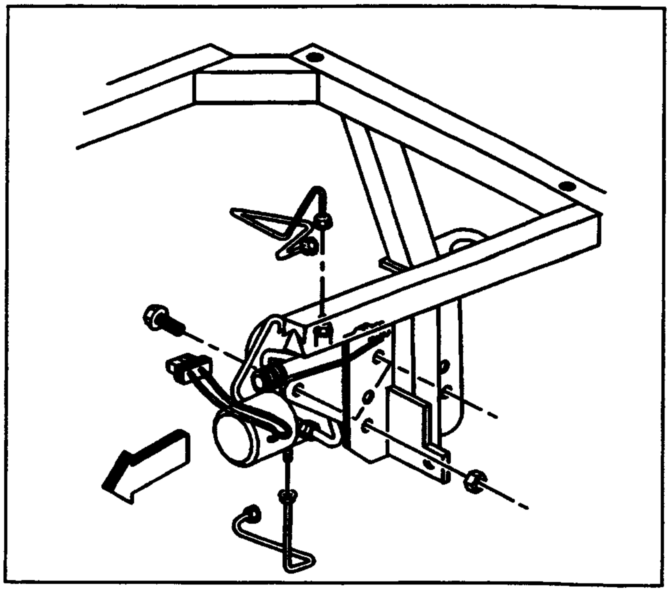


Figure 71—5-Way Valve Installation

3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Disconnect the 5-way valve electrical lead.
5. Remove the bleeder (discharge) line from the top of the 5-way valve assembly.
6. Remove the evaporator line from the front of the 5-way valve assembly.
7. Remove the BTM line from the rear of the 5-way valve assembly.
8. Remove the A/C condenser line from the bottom of the 5-way valve assembly.
9. Remove the bleeder (suction) line from the bottom of the 5-way valve assembly.
10. Remove three nuts and bolts securing valve to mounting bracket.

Install or Connect (Figures 62, 63, 68, 70, and 71)

1. Install the valve to the mounting bracket with three nuts and bolts.

   Tighten

   - Tighten 5-way valve mounting nuts to 10 N·m (88 lbs in).
2. Install new O-ring seals on the bleeder lines (if equipped).
   - Coat O-ring seals with 525 viscosity refrigerant oil.
3. Install the bleeder (suction) line to the bottom of the 5-way valve assembly.

   Tighten

   - Tighten the bleeder line nut to 12 N·m (106 lbs in).
4. Install the A/C condenser line to the bottom of the 5-way valve assembly.

   Tighten

   - Tighten the condenser line nut to 25 N·m (18 lbs ft).
5. Install the BTM line to the rear of the 5-way valve assembly.

   Tighten

   - Tighten the BTM line nut to 25 N·m (18 lbs ft).
6. Install the evaporator line to the front of the 5-way valve assembly.

   Tighten

   - Tighten the evaporator line nut to 25 N·m (18 lbs ft).
7. Install the bleeder (discharge) line to the top of the 5-way valve assembly.

   Tighten

   - Tighten the bleeder line nut to 12 N·m (106 lbs in).
8. Connect the 5-way valve electrical lead.
9. Install the Power Inverter Module. Refer to Drive Motor Controls.
10. Install the high-voltage disconnect. Refer to Battery Pack Controls.
11. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

BLOWER MOTOR RELAY REPLACEMENT

Remove or Disconnect (Figure 72)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Disconnect the electrical connector from relay.
3. Remove the blower motor relay from relay bracket.

Install or Connect (Figure 72)

1. Install the blower motor relay to relay bracket.
2. Connect the electrical connector to relay.
3. Install the negative battery cable. Refer to Auxiliary Battery.
4. Install the high-voltage disconnect. Refer to Battery Pack Controls.
   - Check circuit operation.

CONDENSER REPLACEMENT

Remove or Disconnect (Figures 63, 65, and 73)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.

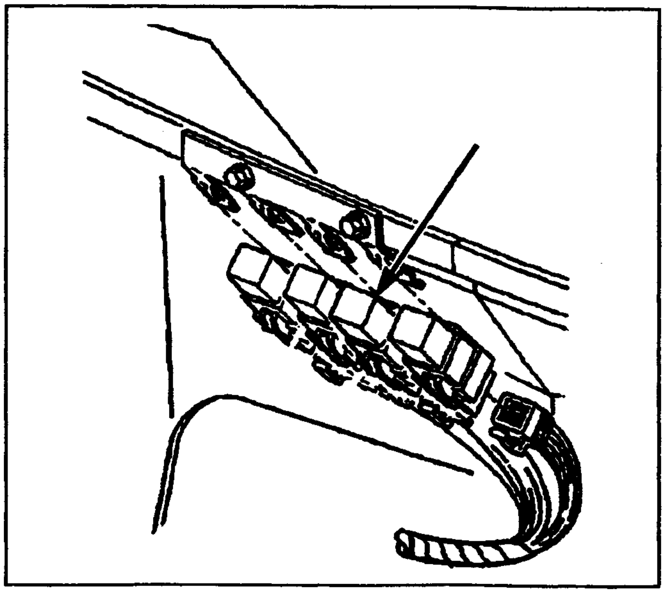


Figure 72—Blower Relay

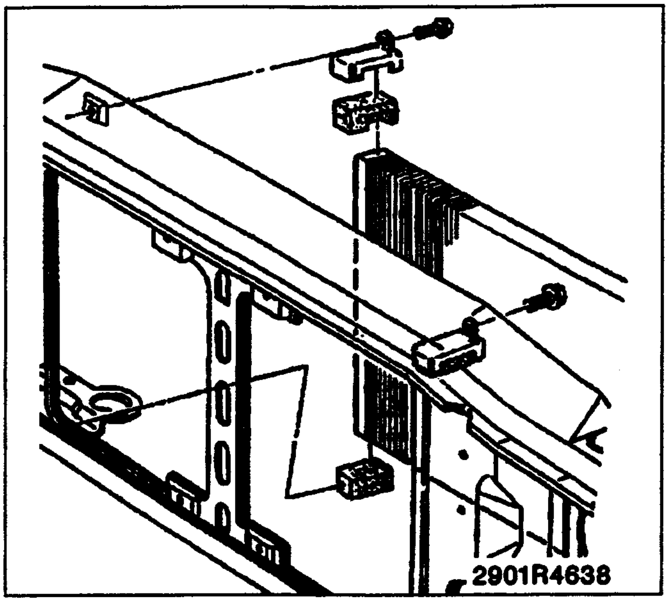


Figure 73—Condenser Assembly

3. Remove the upper fan shroud. Refer to Propulsion System Cooling.
4. Remove the radiator. Refer to Propulsion System Cooling.
5. Remove the five-way valve refrigerant line from the condenser. Refer to Five-Way Valve to Condenser Refrigerant Line Replacement in this section.
6. Remove the reversing valve refrigerant line from the condenser. Refer to Reversing Valve to Condenser Refrigerant Line Replacement in this section.
7. Remove the insulator retainer bolts and the upper insulator retainers.
8. Remove the condenser.

Install or Connect (Figures 63, 65, and 73)

1. Install the condenser. Refer to Refrigerant Oil Distribution in this section.
2. Install the upper insulator retainers and the insulator retainer bolts.

Tighten

- Bolts to 2.4 N.m (21 lb in)

3. Remove the five-way valve refrigerant line from the condenser. Refer to Five-Way Valve to Condenser Refrigerant Line Replacement in this section.
4. Install the reversing valve refrigerant line to the condenser. Refer to Reversing Valve to Condenser Refrigerant Line Replacement in this section.
5. Install the radiator. Refer to Propulsion System Cooling.
6. Install the upper fan shroud. Refer to Propulsion System Cooling.
7. Install the high-voltage disconnect. Refer to Battery Pack Controls.
8. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

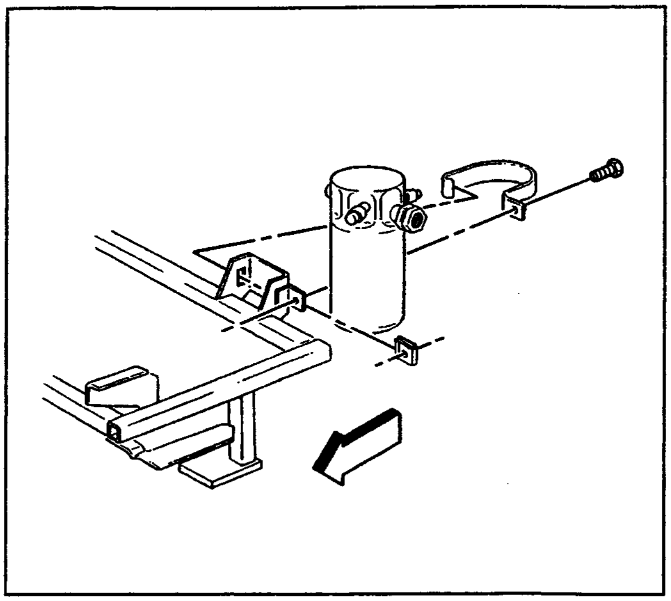


Figure 74—Accumulator Installation

ACCUMULATOR REPLACEMENT

Remove or Disconnect (Figures 66 and 74)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the reversing valve refrigerant line from the accumulator. Refer to Reversing Valve to Accumulator Refrigerant Line Replacement in this section.
4. Remove the compressor hose assembly from the accumulator. Refer to Accumulator to Compressor Refrigerant Hose Replacement in this section.
5. Remove the accumulator clamp bolt.
6. Remove accumulator.

Install or Connect (Figures 66 and 74)

1. Accumulator into accumulator clamp.
2. Accumulator clamp bolt.

Tighten

- Bolt to 10 N.m (88 lb in).

3. Install the compressor hose assembly to the accumulator. Refer to Accumulator to Compressor Refrigerant Hose Replacement in this section.
4. Install the reversing valve refrigerant line to the accumulator. Refer to Reversing Valve to Accumulator Refrigerant Line Replacement in this section.
5. Install the high-voltage disconnect. Refer to Battery Pack Controls.
6. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

EVAPORATOR CORE REPLACEMENT

↔ Remove or Disconnect (Figures 55)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Disconnect the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
3. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
4. Remove the hood. Refer to Hood Replacement in Sheet Metal.
5. Remove the power steering reservoir and bracket. Refer to Steering.
6. Remove the evaporator hose from the reversing valve. Refer to Evaporator to Reversing Valve Refrigerant Hose Replacement in this section.
7. Remove the evaporator line from the five-way valve. Refer to Five-Way Valve to Evaporator Refrigerant Line Replacement in this section.
8. Remove the compressor hose to the reversing valve. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.
9. Remove the right fender. Refer to Fender Replacement in Sheet Metal.
10. Remove the right front wheel house panel. Refer to Wheel House Panel Replacement in Sheet Metal.
11. Remove the evaporator core assembly heat shield.
12. Disconnect electrical connectors/harnesses, as necessary.
13. Remove the blower motor resister. Refer to Blower Motor Resister in this section.
14. Remove five bolts, one stud, and two nuts securing evaporator housing to cowl.
15. Remove screws and nuts securing evaporator core case halves.
16. Disassemble evaporator core case halves.
17. Remove the evaporator core.

→← Install or Connect (Figures 55)

1. Install the evaporator core.
2. Assemble the evaporator core case halves.
3. Install the evaporator core case halves screws and nuts.

Tighten

- Screw and nuts to 2.5 N·m (22 lb in).

4. Install the evaporator housing to cowl with five bolts, one stud, and two nuts.

Tighten

- Tighten evaporator mounting bolts, stud, and nuts to 4.5 N·m (40 lb in).

5. Install the blower motor resistor. Refer to Blower Motor Resistor in this section.
6. Connect electrical connectors/harnesses, as necessary.
7. Install the evaporator core assembly heat shield.
8. Install the right front wheel house panel. Refer to Wheel House Panel Replacement in Sheet Metal.
9. Install the right fender. Refer to Fender Replacement in Sheet Metal.
10. Install the compressor hose to the reversing valve. Refer to Reversing Valve to Compressor Refrigerant Hose Replacement in this section.
11. Install the evaporator line from the five-way valve. Refer to Five-Way Valve to Evaporator Refrigerant Line Replacement in this section.
12. Install the evaporator hose from the reversing valve. Refer to Evaporator to Reversing Valve Refrigerant Hose Replacement in this section.
13. Install the power steering reservoir and bracket. Refer to Steering.
14. Install the hood. Refer to Hood Replacement in Sheet Metal.
15. Connect the negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
16. Install the high-voltage disconnect. Refer to Battery Pack Controls.
17. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

BATTERY THERMAL MODULE (BTM) REPLACEMENT

↔ Remove or Disconnect (Figures 75 and 76)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Raise the vehicle.
4. Remove the skid plate. Refer to Sheet Metal and Fiberglass.

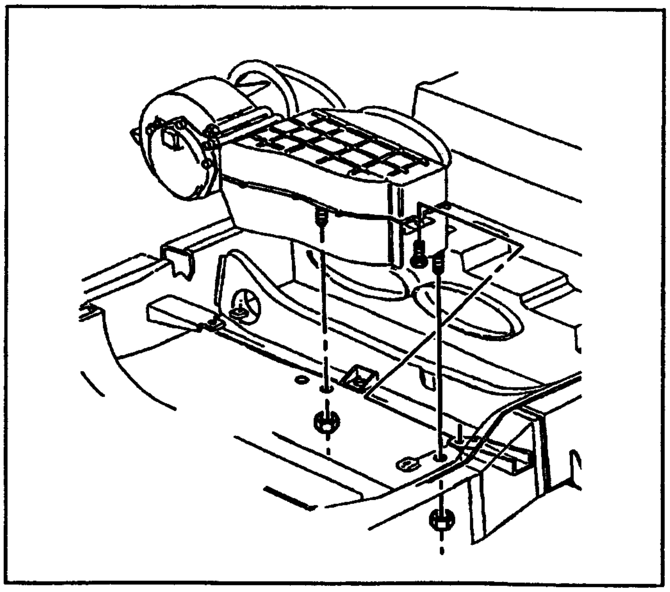


Figure 75—Battery Pack Blower Replacement

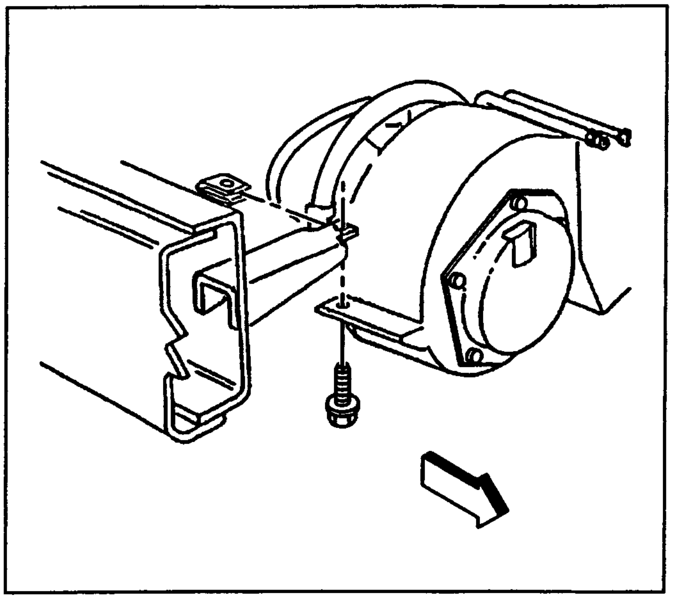


Figure 76—Battery Pack Blower to Frame Installation

5. Remove the Battery Pack. Refer to Battery Pack Controls.
6. Label and disconnect two refrigerant lines from the BTM.
7. Disconnect electrical harness from right-hand side of the BTM.
8. Loosen clamps securing air ducts to the BTM.
9. Remove air ducts from BTM assembly.
10. Remove two mounting bolts from the BTM.
11. Remove the BTM.

Install or Connect (Figures 75 and 76)

1. Install two mounting bolts to BTM.

   Tighten

   - Tighten mounting bolts to 6 N.m (53 lb in.).
2. Position air ducts and clamps on the BTM assembly.
3. Tighten clamps on air ducts.

   Tighten

   - Tighten air duct clamps to 2 N.m (17 lb in.).
4. Install refrigerant lines to the BTM.

   Tighten

   - Tighten the line nuts to 25 N.m (18 lbs ft).
5. Connect electrical harness to right-hand side of the BTM.
6. Install the Battery Pack. Refer to Battery Pack Controls.
7. Install skid plate. Refer to Sheet Metal and Fiberglass.
8. Lower the vehicle.
9. Install the high-voltage disconnect. Refer to Battery Pack Controls.
10. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
    - Check the system for leaks.

BATTERY THERMAL MODULE (BTM) EVAPORATOR CORE REPLACEMENT

Remove or Disconnect (Figure 77)

1. High-voltage disconnect. Refer to Battery Pack Controls.
2. Evacuate the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
3. Remove the battery thermal module. Refer to Battery Thermal Module (BTM) Replacement in this section.
4. Blower motor from the BTM.
5. Remove the air ducts.
6. Remove thirteen screws securing the BTM halves.
7. Remove the evaporator core.

Install or Connect (Figure 77)

1. Install the evaporator core into the BTM.

   Tighten

   - Tighten the BTM evaporator core screw to 10 N.m (88 lb in).
2. Install thirteen screws securing BTM case halves.

   Tighten

   - Tighten the BTM case screws to 10 N.m (88 lb in).
3. Install air ducts.

   Tighten

   - Tighten the BTM air duct screws to 2 N.m (17 lb in).
4. Blower motor to the BTM.

   Tighten

   - Tighten the BTM blower motor screws to 10 N.m (88 lb in).
5. Install the BTM. Refer to Battery Thermal Module (BTM) Replacement in this section.
6. Install the high-voltage disconnect. Refer to Battery Pack Controls.
7. Recharge the air conditioning refrigerant system. Refer to Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures in this section.
   - Check the system for leaks.

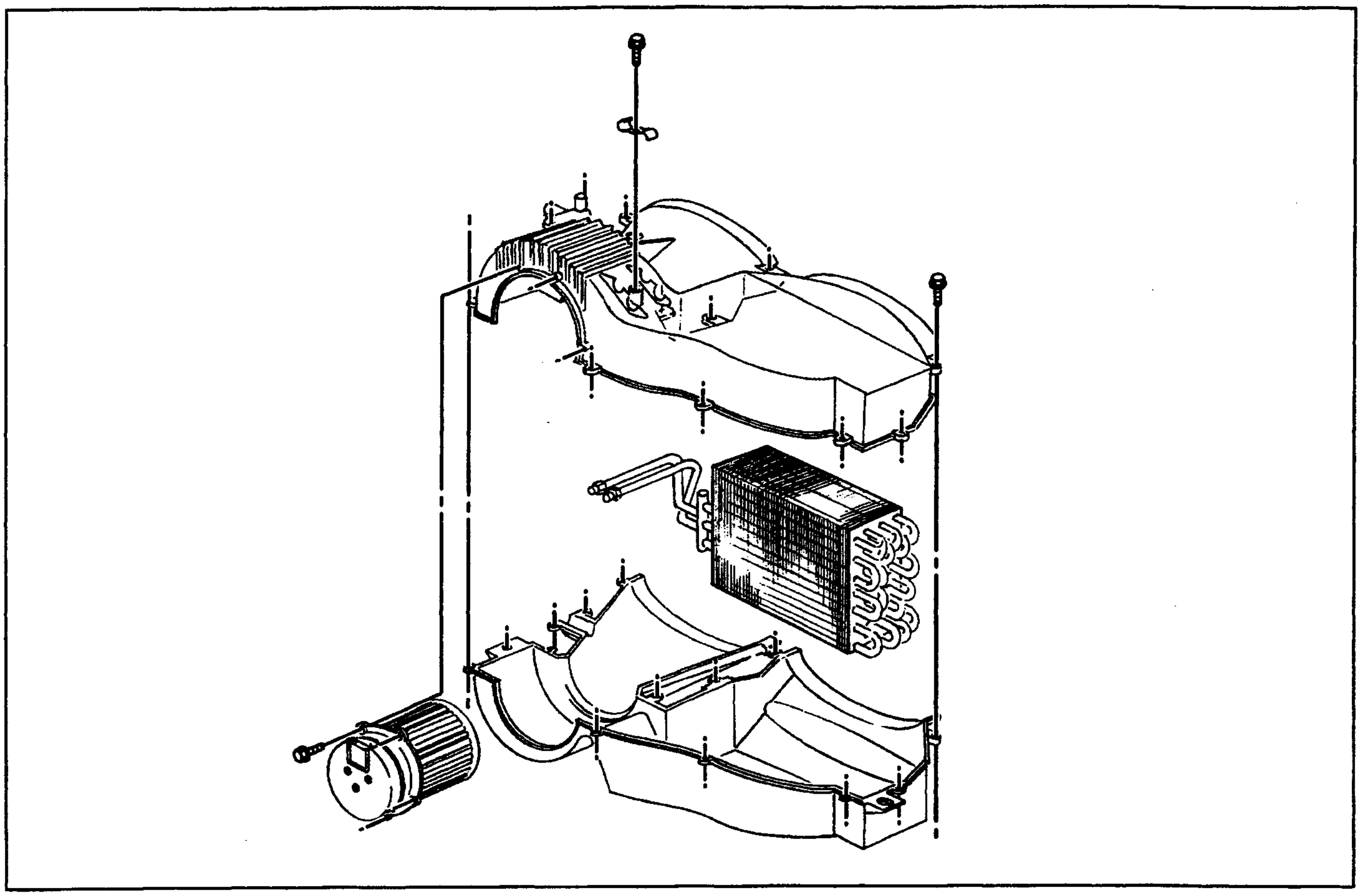


Figure 77—BTM Evaporator Core

SPECIFICATIONS

GENERAL SPECIFICATIONS

Compressor	Type	Displacement
Panasonic	Dual rolling piston 180 volt	19 cc per revolution

SYSTEM CAPACITIES

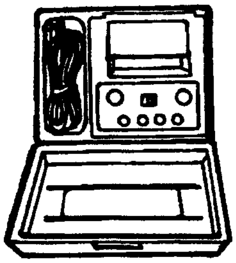
Application	ml	fl oz	Kg	Lb
Refrigerant-134a	—	—	0.9 kg	2.0 lb
Panasonic RB68EV Polyol Ester Refrigerant Oil	400 ml	13.52 fl oz	—	—
Texaco Havoline® ELECTRA-COOL ™ (GM P/N 27002485)	6521 ml	220 fl oz (1.7 gal)	—	—

FASTENER TIGHTENING SPECIFICATIONS

Application	N·m	Lb Ft	Lb In
Accumulator Clamp Bolt	10	—	88
Accumulator to Compressor Refrigerant Line (At Accumulator)	45	33	—
Accumulator to Compressor Refrigerant Line (At Compressor)	25	18	—
Air Distributor Duct Mounting Screw	1.9	—	17
Air Inlet Studs	4.5	—	40
Air Distributor Duct Screws	1.9	—	17
Air Inlet Assembly Mounting Bolts	4.5	—	40
BTM Air Duct Clamps	2	—	17
BTM Blower Motor Screws	10	—	88
BTM Case Screws	10	—	88
BTM Mounting Bolts	6	—	53
Bleeder Line Nuts	12	—	106
Blower Motor and Fan Mounting Screws	1.5	—	13
Blower Motor Resistor Mounting Screws	1.9	—	17
Compressor Mounting Bolts	1.5 + 6.5 revolutions	—	13
Compressor Upper Mounting Bracket Bolts	6	—	53
Cross Member Mounting Screws	54	40	—
Evaporator and Blower Module Mounting Bolts	4.5	—	40
Evaporator and Blower Module Mounting Nuts	4.5	—	40
Evaporator and Blower Module Mounting Stud	4.5	—	40
Evaporator to Reversing Valve Refrigerant Hose	25	18	—
Exhaust Pipe Hanger Bracket Bolt	17	—	150
Exhaust Pipe Heat Shield Mounting Bolts	1.9	—	17
Exhaust Pipe Clamp	10	—	88
Five-Way Valve Mounting Nuts	10	—	88
Five-Way Valve to BTM Refrigerant Line	25	18	—
Five-Way Valve to Condenser Refrigerant Line	25	18	—
Five-Way Valve to Evaporator Refrigerant Line	25	18	—
Floor Air Outlet Mounting Screws	3.1	—	27
Fuel Filler Tube and Vent Clamps	2.5	—	22
Fuel-Fired Heater Mounting Screws	10	—	88
Fuel-Fired Heater Reservoir Mounting Screws	1.9	—	17
Fuel-Fired Heater Tank Fuel Hose Clamp	1.9	—	17
Fuel Tank Mounting Screws	25	18	—
Fuel Sensor	2	—	17
Heater Assembly Studs	1.9	—	17
Heater Control Mounting Screws	1.9	—	17
Lap Air Outlet Screws	1.9	—	17
Reversing Valve Mounting Bolts	10	—	88
Reversing Valve to Accumulator Refrigerant Line (At Accumulator)	45	33	—
Reversing Valve to Accumulator Refrigerant Line (At Reversing Valve)	25	18	—
Reversing Valve to BTM Refrigerant Line	25	18	—
Reversing Valve to Compressor Refrigerant Hose	25	18	—
Reversing Valve to Condenser Refrigerant Line	25	18	—
Windshield Defroster Nozzle Distributor Mounting Screws	2	—	18

SPECIAL TOOLS

1.



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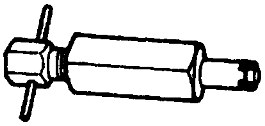
2.



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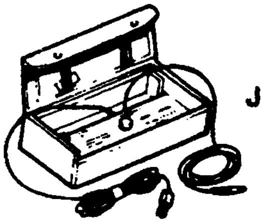

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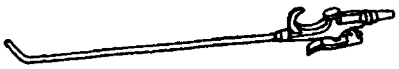

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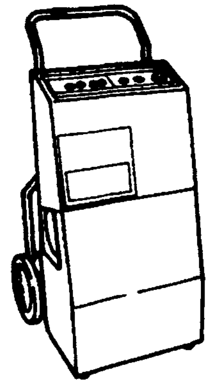

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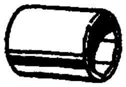

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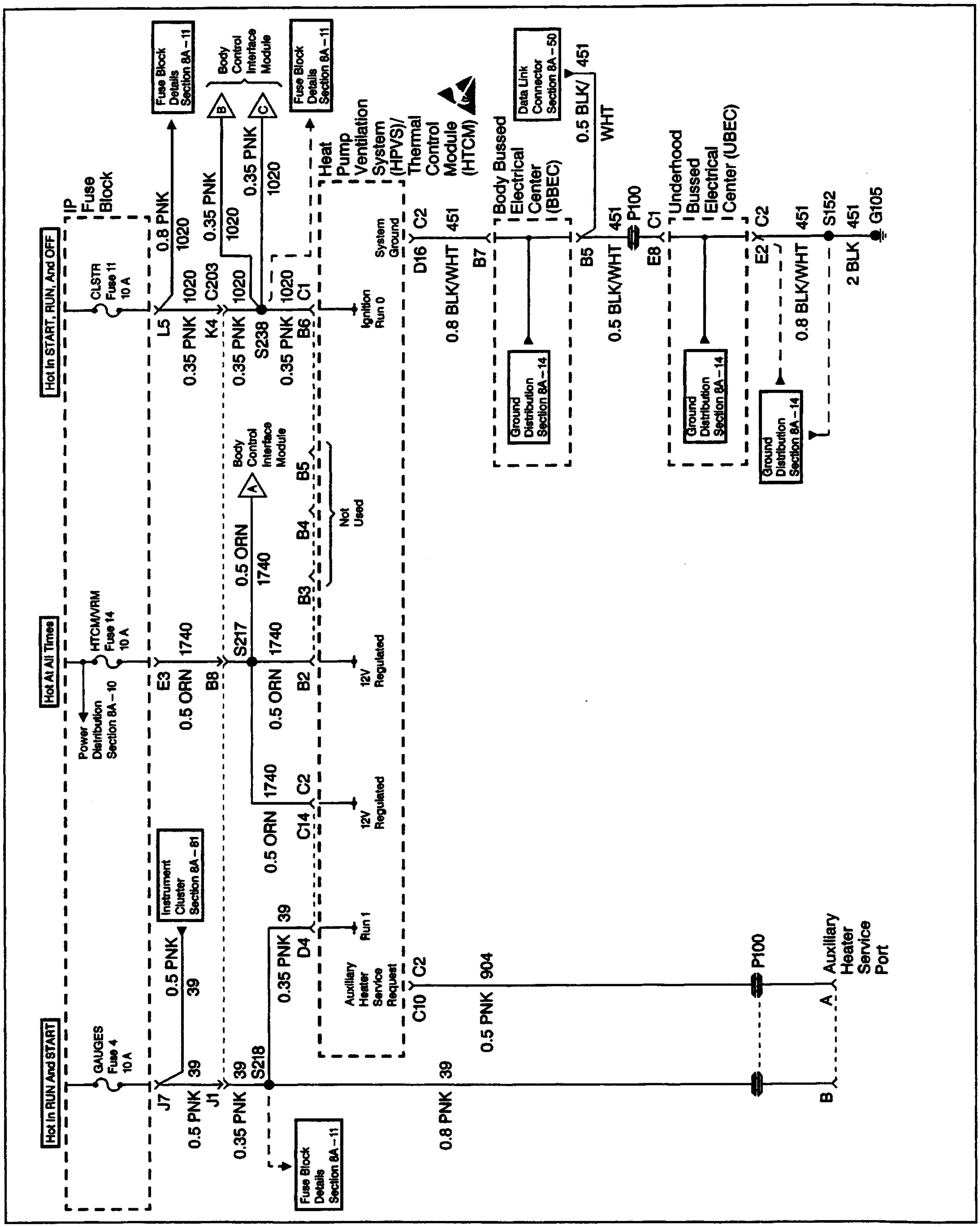
1. FOUR JACK-DUAL RANGE TEMPERATURE TESTER
2. ORIFICE RUBE REMOVER AND EXTRACTOR
3. H-10 LEAK DETECTOR
4. EVAPORATOR CLEANING GUN
5. REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING STATION
6. CHARGE VALVE OCTAGON SOCKET

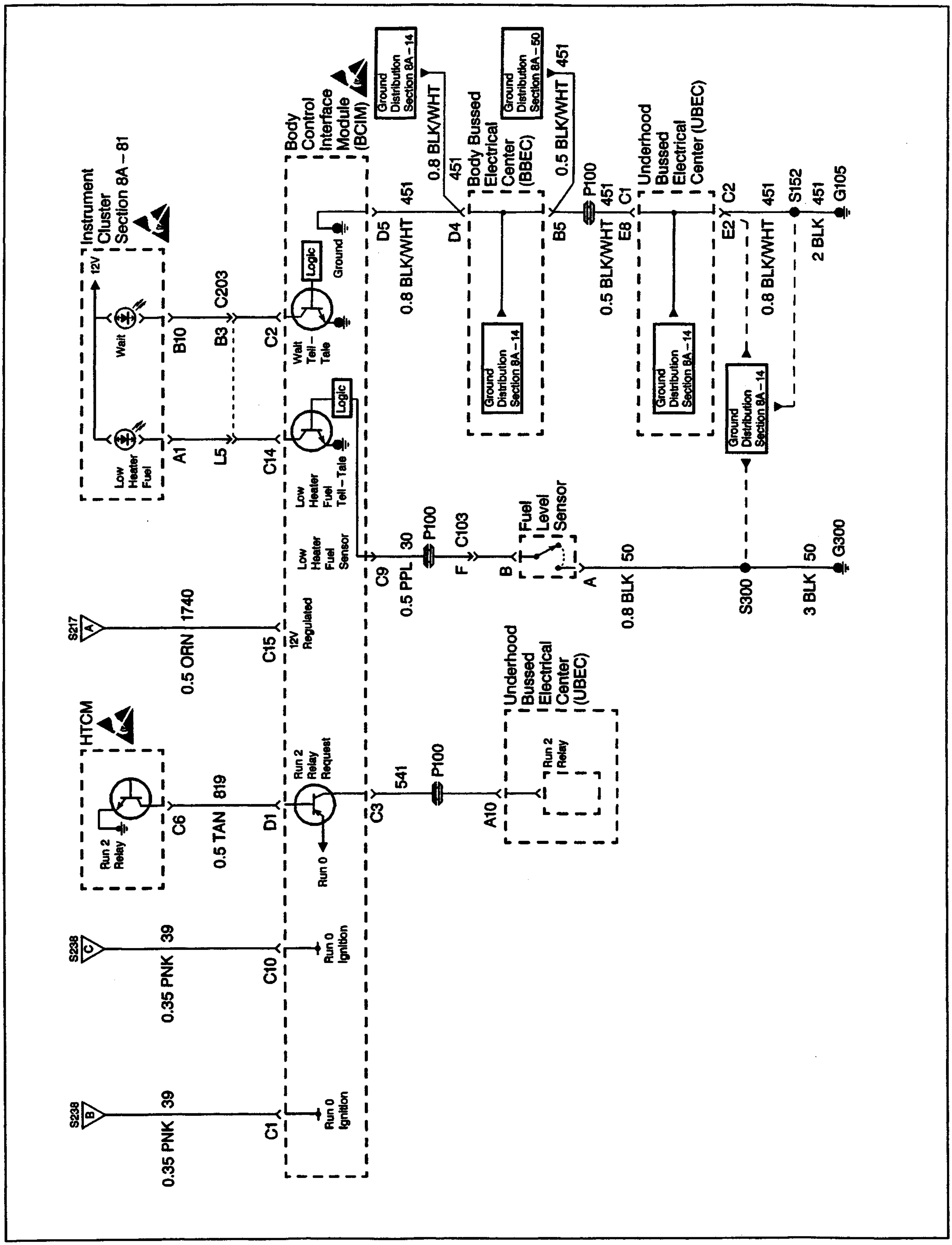
BLANK

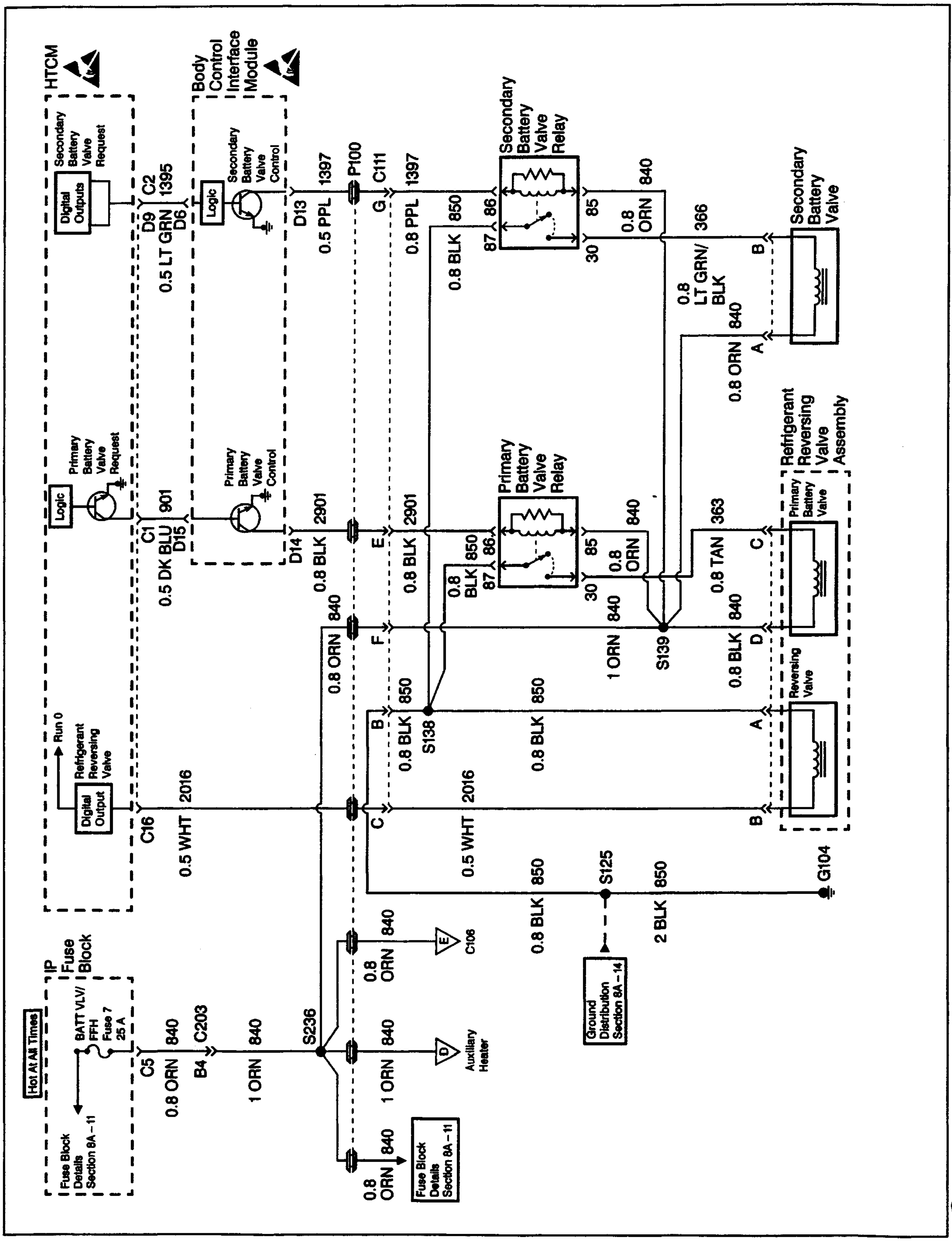
SECTION 1B1

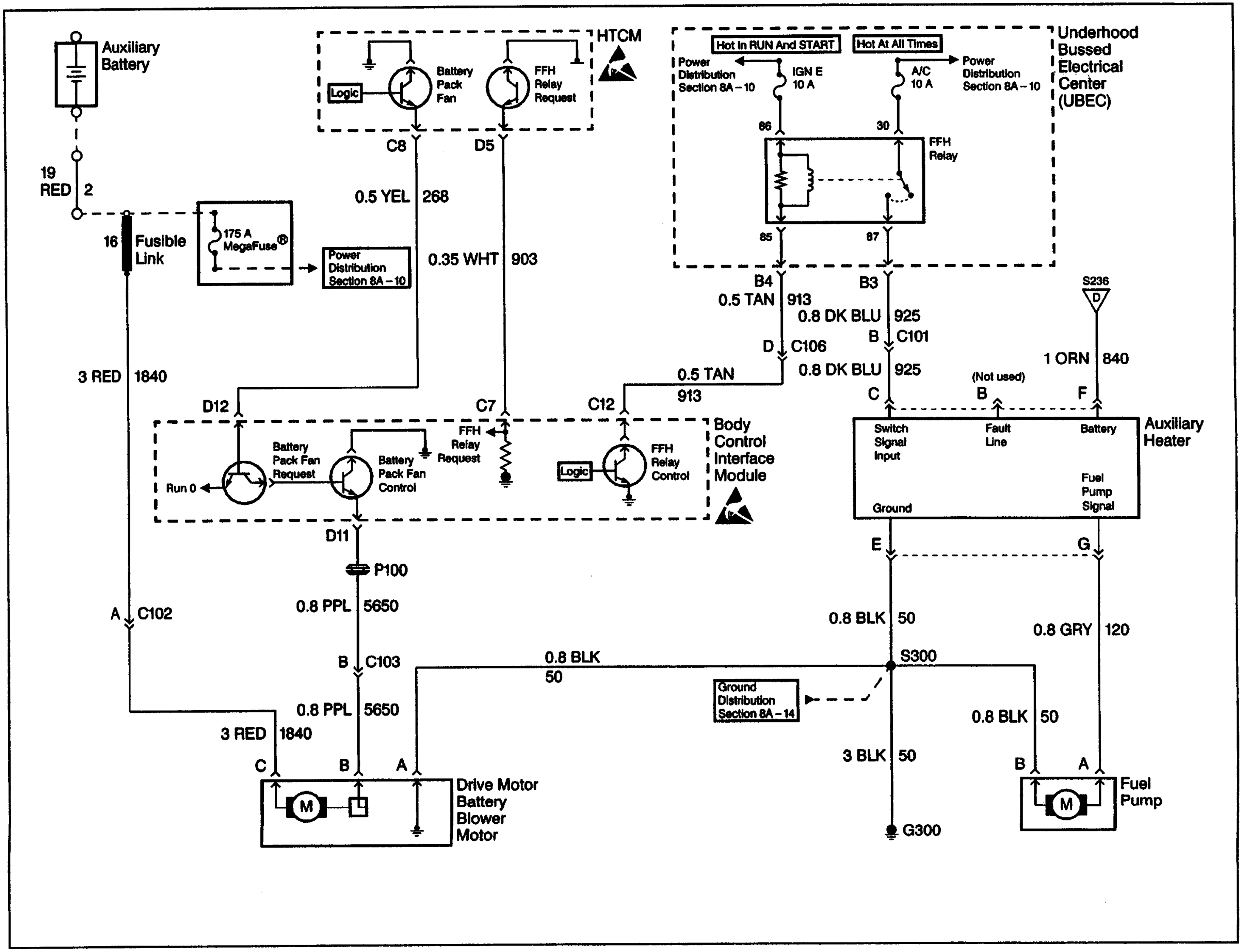
HEAT PUMP VENTILATION SYSTEM THERMAL CONTROL MODULE (HTCM)

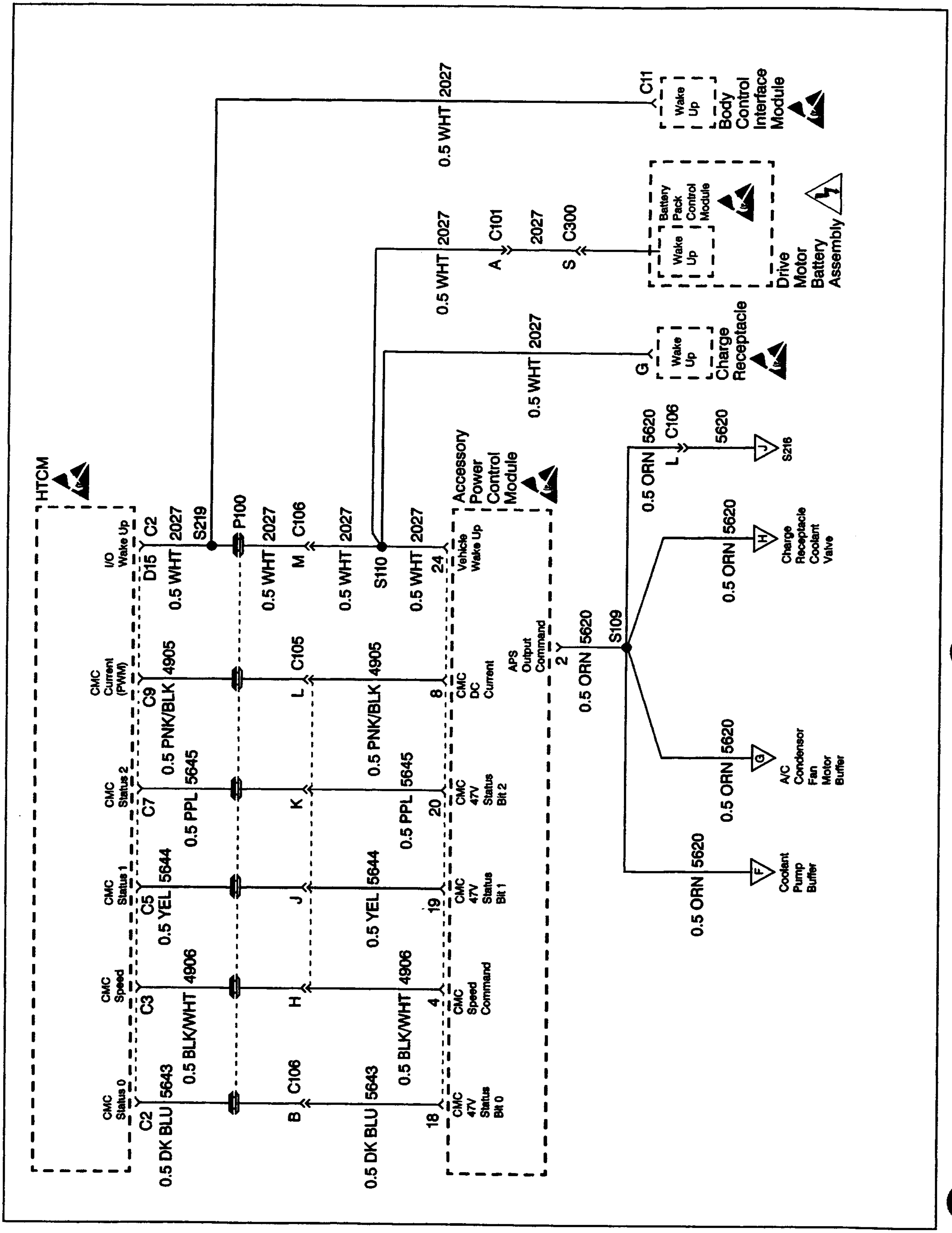
HTCM Diagnostic System Check

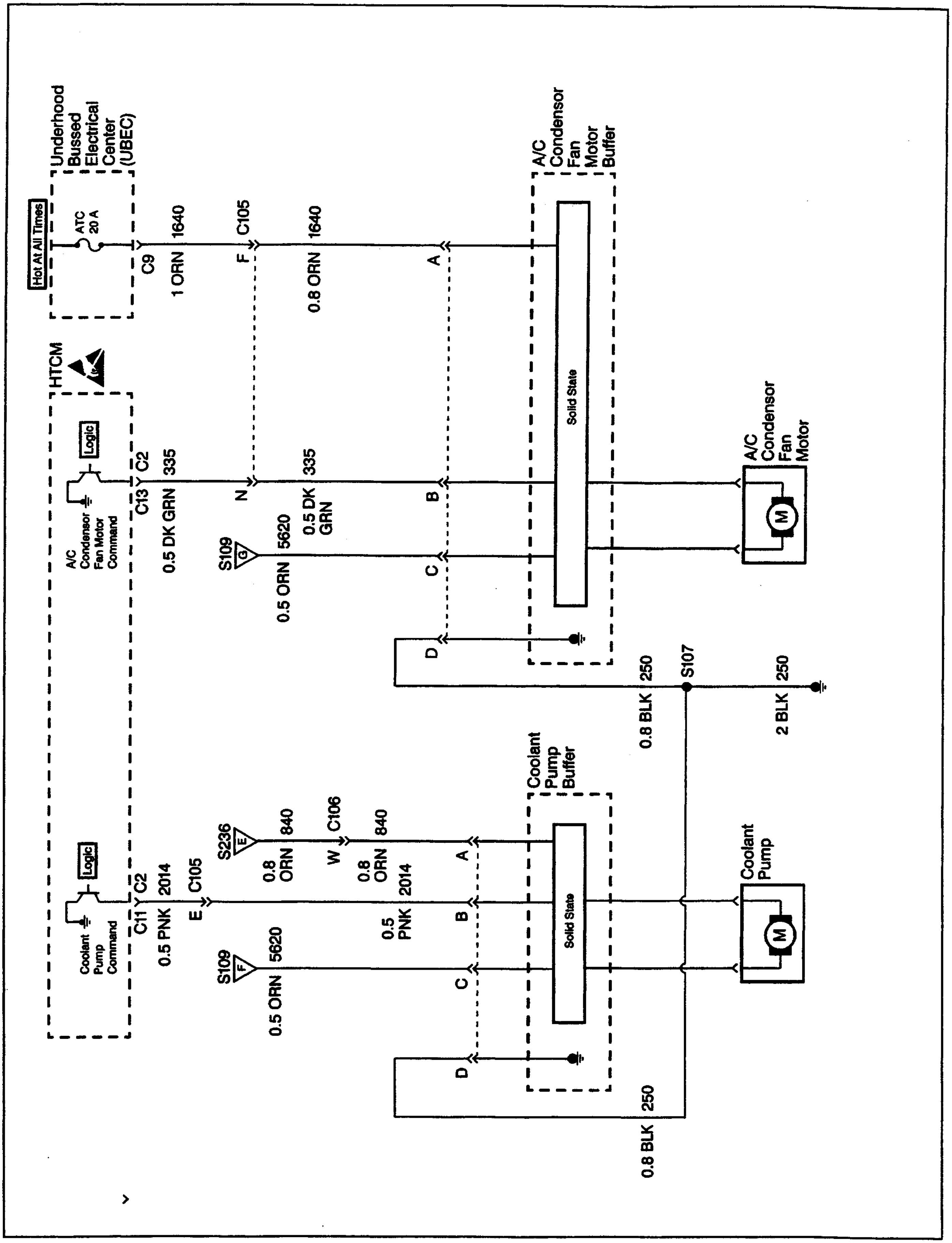

Hot In START, RUN, And OFF
Hot At All Times
Hot In RUN And START
IP Fuse Block
CLSTR Fuse 11 10 A
HTCM/VRM Fuse 14 10 A
GAUGES Fuse 4 10 A
Power Distribution Section 8A-10
Fuse Block Details Section 8A-11
Body Control Interface Module
Instrument Cluster Section 8A-81
L5
0.35 PNK
1020
0.8 PNK
K4
C203
S238
B6
C1
0.35 PNK
E3
B8
0.5 ORN
1740
S217
B2
C2
C14
B3
B4
B5
Not Used
J7
J1
0.5 PNK
39
S218
D4
C10
904
0.8 PNK
Ignition Run 0
12V Regulated
Run 1
Auxiliary Heater Service Request
System Ground
D16
C2
0.8 BLK/WHT
451
B7
Heat Pump Ventilation System (HPVS)/ Thermal Control Module (HTCM)
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
Data Link Connector Section 8A-50
0.5 BLK/ WHT
B5
P100
E8
C1
Underhood Bussed Electrical Center (UBEC)
E2
S152
2 BLK
G105
Auxiliary Heater Service Port
A
B

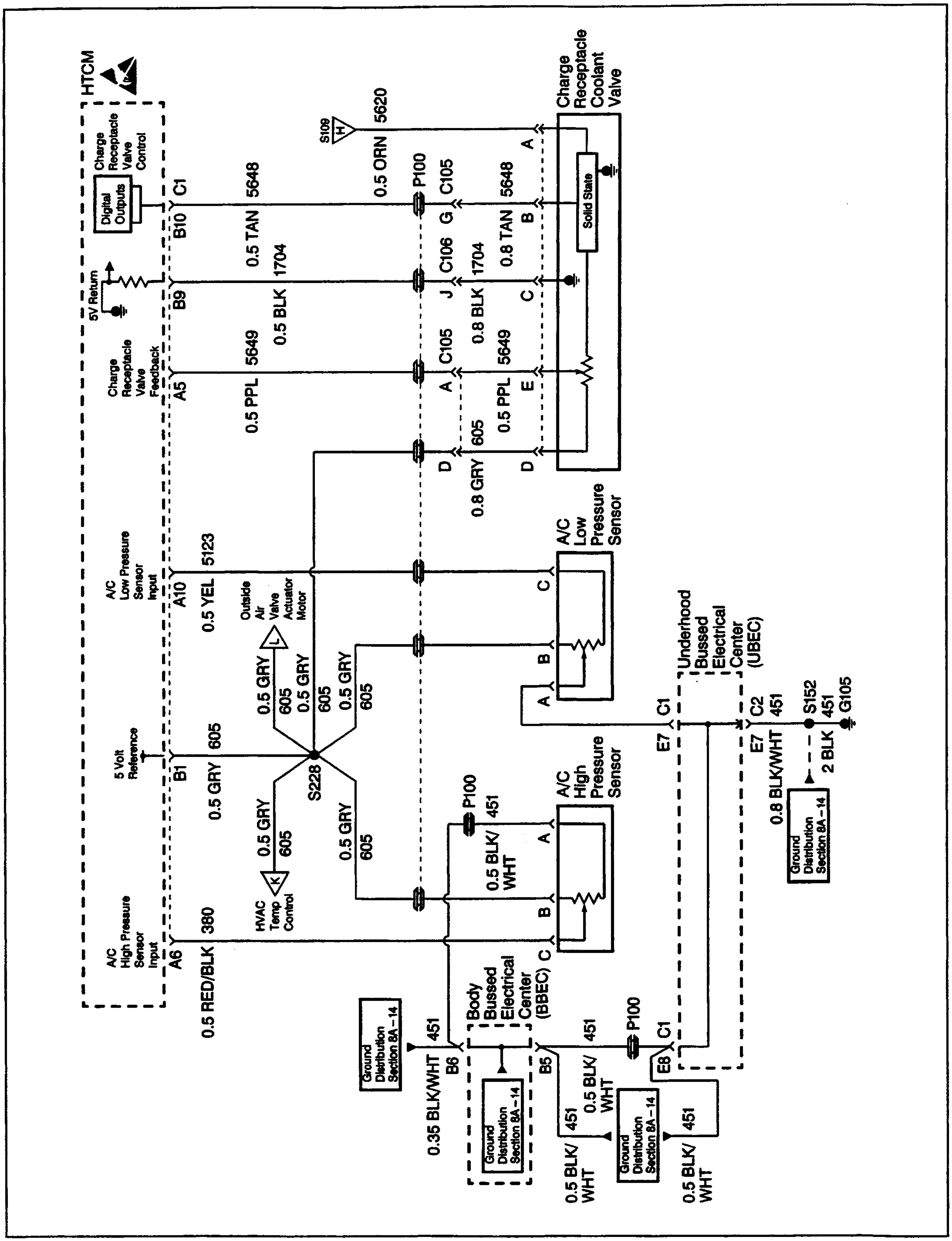

Instrument Cluster Section 8A – 81
12V
Wait
Low Heater Fuel
B10
A1
B3
C203
L5
Body Control Interface Module (BCIM)
Logic
Ground
Wait Tell-Tale
Low Heater Fuel Tell-Tale
Low Heater Fuel Sensor
C2
C14
D5
0.8 BLK/WHT
451
D4
0.8 BLK/WHT
451
Ground Distribution Section 8A – 14
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A – 14
Ground Distribution Section 8A – 50
B5
0.5 BLK/WHT
451
P100
451
C1
E8
0.5 BLK/WHT
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A – 14
C2
E2
451
0.8 BLK/WHT
Ground Distribution Section 8A – 14
S152
451
2 BLK
G105
C9
30
0.5 PPL
P100
C103
F
B
Fuel Level Sensor
A
50
0.8 BLK
S300
50
3 BLK
G300
S217
A
1740
0.5 ORN
C15
12V Regulated
HTCM
Run 2 Relay
C6
819
0.5 TAN
D1
Run 2 Relay Request
Run 0
C3
541
P100
A10
Underhood Bussed Electrical Center (UBEC)
Run 2 Relay
S238
C
39
0.35 PNK
C10
Run 0 Ignition
S238
B
39
0.35 PNK
C1
Run 0 Ignition

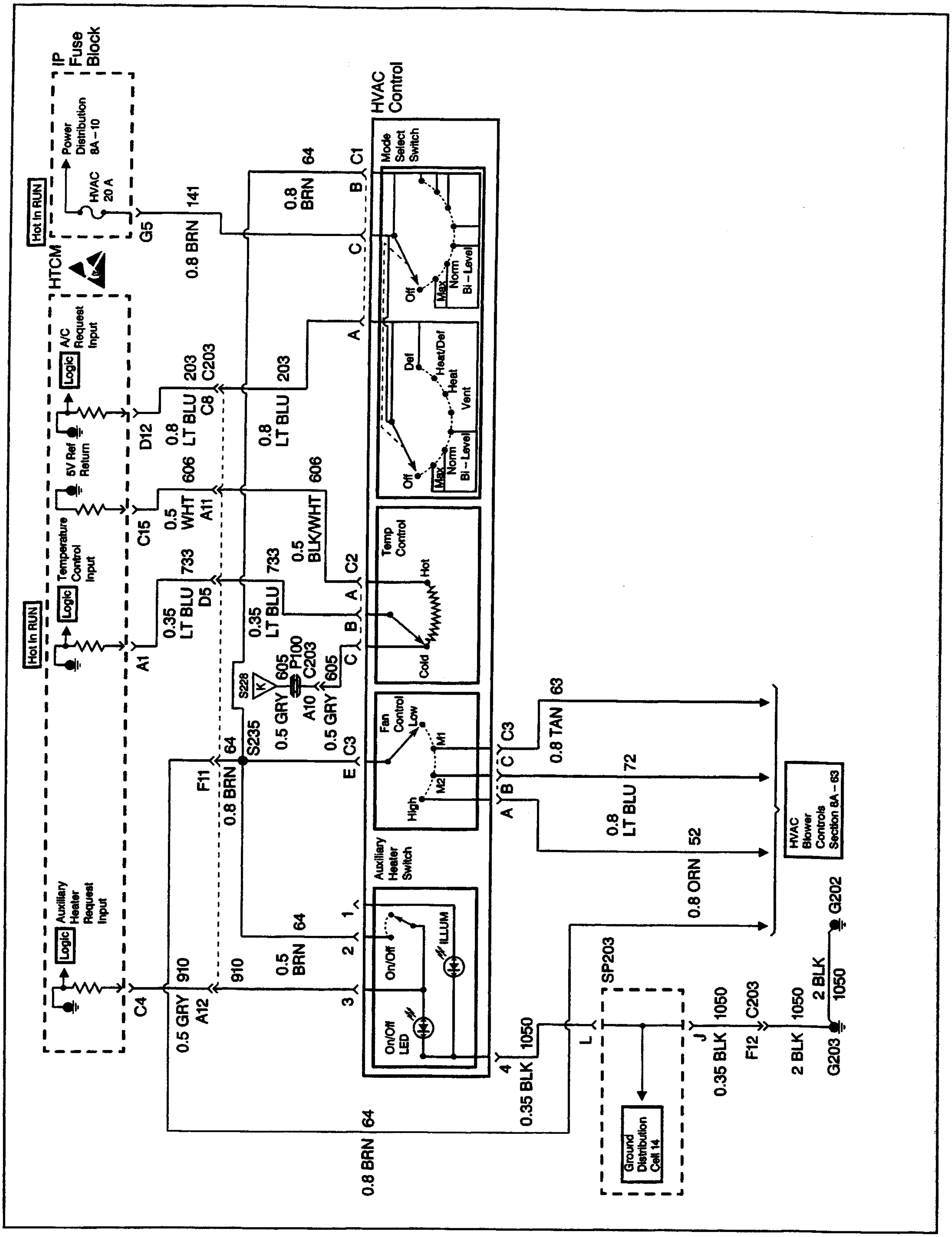

HTCM
Body Control Interface Module
Secondary Battery Valve Request
Digital Outputs
C2
1395
D9
0.5 LT GRN
D6
Logic
Secondary Battery Valve Control
D13
1397
0.5 PPL
P100
C111
G
1397
0.8 PPL
Secondary Battery Valve Relay
86
850
0.8 BLK
87
85
30
0.8 ORN
840
366
0.8 LT GRN/BLK
B
A
840
0.8 ORN
Secondary Battery Valve
Primary Battery Valve Request
Logic
C1
901
0.5 DK BLU
D15
Primary Battery Valve Control
D14
2901
0.8 BLK
E
2901
0.8 BLK
Primary Battery Valve Relay
850
86
0.8 BLK
87
85
0.8 ORN
840
30
Refrigerant Reversing Valve Assembly
Primary Battery Valve
363
0.8 TAN
C
D
840
0.8 BLK
840
0.8 ORN
F
840
1 ORN
S139
Run 0
Refrigerant Reversing Valve
Digital Output
C16
2016
0.5 WHT
B
850
0.8 BLK
S138
850
0.8 BLK
A
Reversing Valve
C
2016
0.5 WHT
B
850
0.8 BLK
S125
850
2 BLK
G104
Ground Distribution Section 8A-14
Hot At All Times
IP Fuse Block
BATT VLV/FFH Fuse 7 25 A
Fuse Block Details Section 8A-11
C5
840
0.8 ORN
C203
B4
840
1 ORN
S236
840
0.8 ORN
E
C106
840
1 ORN
D
Auxiliary Heater
0.8 ORN
840
Fuse Block Details Section 8A-11

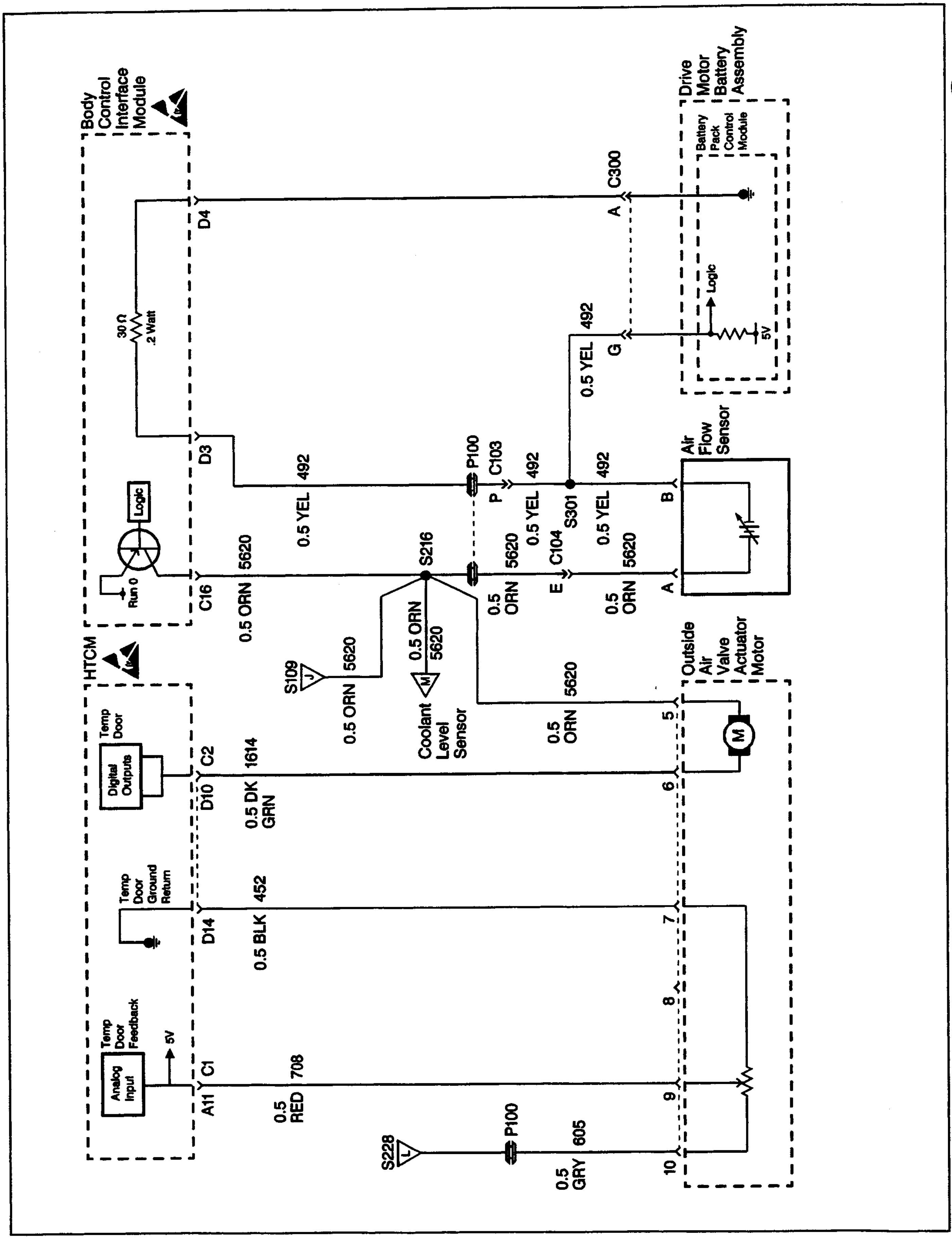

Auxiliary Battery
19
RED
2
16
Fusible Link
175 A MegaFuse®
Power Distribution Section 8A – 10
3 RED
1840
A
C102
HTCM
Logic
Battery Pack Fan
FFH Relay Request
C8
D5
0.5 YEL
268
0.35 WHT
903
D12
C7
C12
Battery Pack Fan Request
Run 0
Battery Pack Fan Control
FFH Relay Request
Logic
FFH Relay Control
Body Control Interface Module
D11
P100
0.8 PPL
5650
B
C103
0.8 PPL
5650
3 RED
1840
C
B
A
Drive Motor Battery Blower Motor
0.8 BLK
50
Hot In RUN And START
Hot At All Times
Power Distribution Section 8A – 10
IGN E 10 A
A/C 10 A
Power Distribution Section 8A – 10
Underhood Bussed Electrical Center (UBEC)
86
30
FFH Relay
85
87
B4
0.5 TAN
913
D
C106
0.5 TAN
913
B3
0.8 DK BLU
925
B
C101
0.8 DK BLU
925
S236
D
1 ORN
840
C
(Not used)
B
F
Switch Signal Input
Fault Line
Battery
Fuel Pump Signal
Ground
Auxiliary Heater
E
G
0.8 BLK
50
S300
Ground Distribution Section 8A – 14
3 BLK
50
G300
0.8 GRY
120
0.8 BLK
50
B
A
Fuel Pump

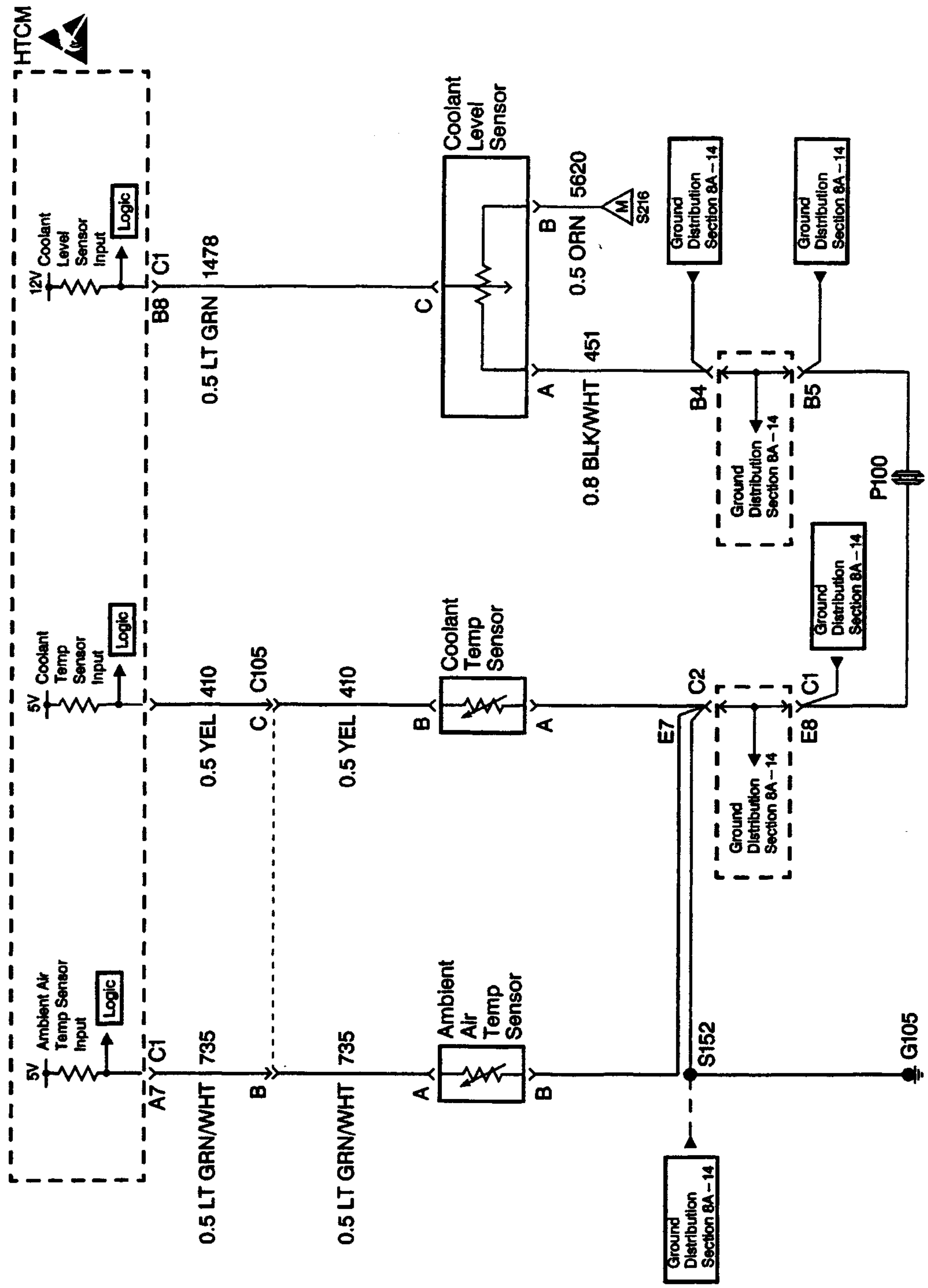

HTCM
I/O Wake Up
D15
C2
0.5 WHT
2027
S219
P100
C106
M
S110
24
Vehicle Wake Up
Accessory Power Control Module
CMC Current (PWM)
C9
0.5 PNK/BLK
4905
C105
L
8
CMC DC Current
CMC Status 2
C7
0.5 PPL
5645
K
20
CMC 47V Status Bit 2
CMC Status 1
C5
0.5 YEL
5644
J
19
CMC 47V Status Bit 1
CMC Speed
C3
0.5 BLK/WHT
4906
H
4
CMC Speed Command
CMC Status 0
C2
0.5 DK BLU
5643
B
18
CMC 47V Status Bit 0
APS Output Command
2
0.5 ORN
5620
S109
C106
L
J
S216
H
Charge Receptacle Coolant Valve
G
A/C Condensor Fan Motor Buffer
F
Coolant Pump Buffer
G
Wake Up
Charge Receptacle
A
C101
S
C300
Wake Up
Battery Pack Control Module
Drive Motor Battery Assembly
C11
Wake Up
Body Control Interface Module

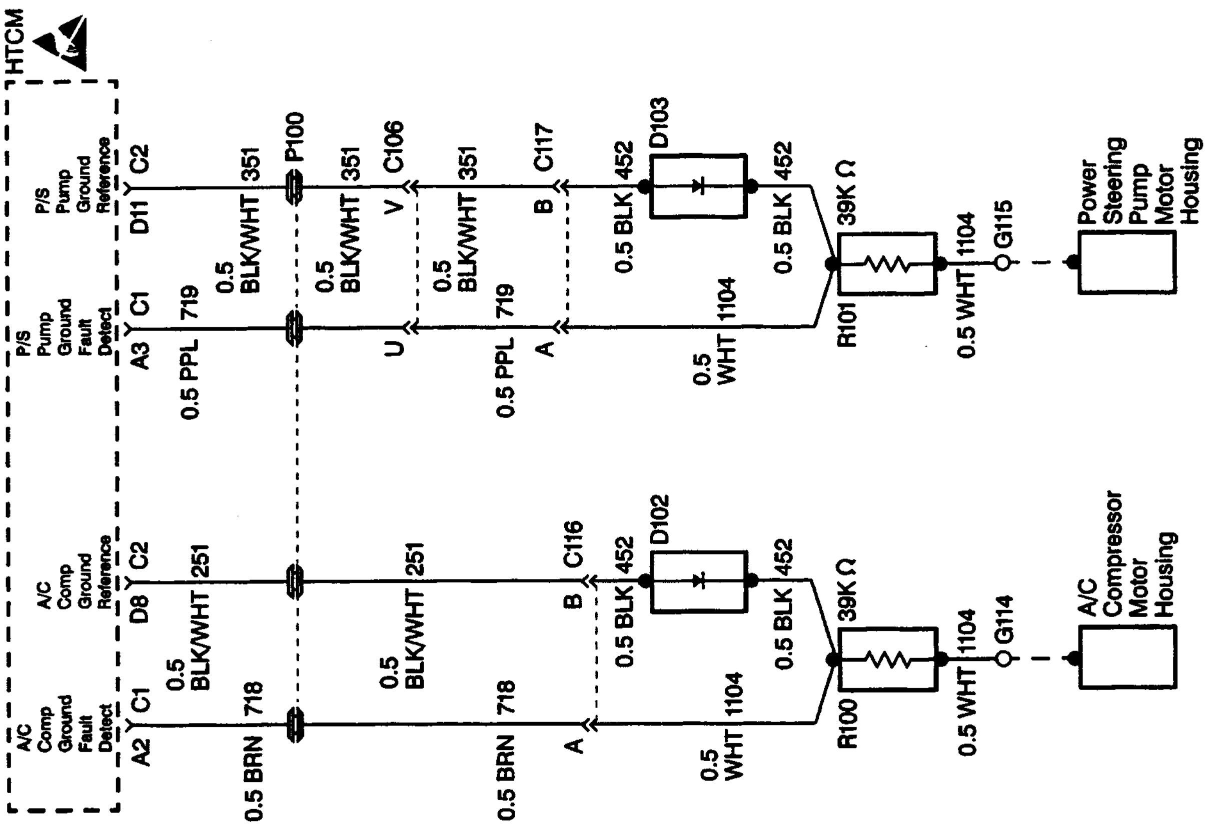

Hot At All Times
Underhood Bussed Electrical Center (UBEC)
ATC 20 A
C9
1 ORN
1640
C105
F
0.8 ORN
1640
A
A/C Condensor Fan Motor Buffer
Solid State
HTCM
Logic
A/C Condensor Fan Motor Command
C13
C2
0.5 DK GRN
335
N
0.5 DK GRN
335
B
S109
G
5620
0.5 ORN
C
D
A/C Condensor Fan Motor
M
0.8 BLK
250
S107
2 BLK
250
Coolant Pump Buffer
Coolant Pump Command
Logic
C11
C2
0.5 PNK
2014
C105
E
S236
E
0.8 ORN
840
C106
W
0.8 ORN
840
0.5 PNK
2014
A
B
Solid State
S109
F
0.5 ORN
5620
C
D
Coolant Pump
M
0.8 BLK
250


HTCM
Charge Receptacle Valve Control
Digital Outputs
5V Return
Charge Receptacle Valve Feedback
A/C Low Pressure Sensor Input
5 Volt Reference
A/C High Pressure Sensor Input
C1
B10
B9
A5
A10
B1
A6
0.5 TAN 5648
0.5 BLK 1704
0.5 PPL 5649
0.5 YEL 5123
0.5 GRY 605
0.5 RED/BLK 380
S109
H
5620
0.5 ORN
P100
C105
G
C106
J
C105
A
D
0.8 GRY 605
5648
0.8 TAN
B
1704
0.8 BLK
C
5649
0.5 PPL
E
D
A
Charge Receptacle Coolant Valve
Solid State
Outside Air Valve Actuator Motor
L
0.5 GRY 605
0.5 GRY 605
0.5 GRY 605
S228
0.5 GRY 605
K
HVAC Temp Control
0.5 GRY 605
A/C Low Pressure Sensor
C
B
A
A/C High Pressure Sensor
A
B
C
P100
451
0.5 BLK/ WHT
Underhood Bussed Electrical Center (UBEC)
C1
E7
C2
E7
451
S152
451
G105
0.8 BLK/WHT
2 BLK
Ground Distribution Section 8A-14
Body Bussed Electrical Center (BBEC)
451
0.35 BLK/WHT
B6
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
B5
451
P100
C1
E8
0.5 BLK/ WHT
451
0.5 BLK/ WHT
Ground Distribution Section 8A-14
451
0.5 BLK/ WHT
0.5 BLK/ WHT

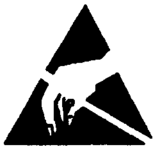
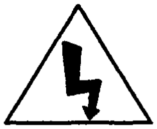

Hot In RUN
IP Fuse Block
HVAC 20 A
Power Distribution 8A-10
G5
0.8 BRN 141
HTCM
Logic
A/C Request Input
5V Ref Return
D12
0.8 LT BLU 203
C8
C203
C15
0.5 WHT 606
A11
Logic
Temperature Control Input
A1
0.35 LT BLU 733
D5
Logic
Auxiliary Heater Request Input
C4
0.5 GRY 910
A12
F11
0.8 BRN 64
S235
S228
K
605
P100
C203
0.5 GRY
A10
0.5 GRY 605
0.5 GRY C3
0.35 LT BLU 733
0.5 BLK/WHT 606
0.8 LT BLU 203
0.8 BRN
64
C1
B
C
A
HVAC Control
Mode Select Switch
Off
Max
Norm
Bi-Level
Def
Heat/Def
Heat
Vent
Temp Control
Hot
Cold
C2
Fan Control
Low
M1
M2
High
E
Auxiliary Heater Switch
On/Off
ILLUM
On/Off LED
1
2
3
4
0.5 BRN 64
910
0.8 BRN 64
0.35 BLK 1050
C3
0.8 TAN 63
0.8 LT BLU 72
0.8 ORN 52
HVAC Blower Controls Section 8A-63
G202
SP203
L
J
Ground Distribution Cell 14
0.35 BLK 1050
F12
C203
2 BLK 1050
G203


Body Control Interface Module
Drive Motor Battery Assembly
Battery Pack Control Module
C300
A
D4
30 Ω
.2 Watt
Logic
5V
G
492
0.5 YEL
D3
P100
C103
P
492
0.5 YEL
S301
Air Flow Sensor
B
Logic
Run 0
C16
5620
0.5 ORN
S216
C104
E
0.5 ORN
A
HTCM
S109
J
0.5 ORN
M
Coolant Level Sensor
Outside Air Valve Actuator Motor
5
M
Temp Door
Digital Outputs
C2
1614
D10
0.5 DK GRN
6
Temp Door Ground Return
D14
452
0.5 BLK
7
8
Temp Door Feedback
Analog Input
5V
C1
A11
708
0.5 RED
9
S228
L
P100
605
0.5 GRY
10


HTCM
12V
Coolant Level Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
5V
Ambient Air Temp Sensor Input
Logic
B8
C1
1478
0.5 LT GRN
Coolant Level Sensor
C
A
B
5620
0.5 ORN
M
S216
451
0.8 BLK/WHT
B4
B5
P100
410
0.5 YEL
C105
C
410
0.5 YEL
Coolant Temp Sensor
B
A
E7
C2
E8
C1
A7
C1
735
0.5 LT GRN/WHT
B
735
0.5 LT GRN/WHT
Ambient Air Temp Sensor
A
B
S152
G105
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14


HTCM
A/C Comp Ground Fault Detect
A/C Comp Ground Reference
P/S Pump Ground Fault Detect
P/S Pump Ground Reference
A2
C1
D8
C2
A3
C1
D11
C2
0.5 BRN
718
0.5 BLK/WHT
251
0.5 PPL
719
0.5 BLK/WHT
351
P100
C106
U
V
C116
C117
A
B
0.5 WHT
1104
0.5 BLK
452
D102
D103
R100
R101
39K Ω
G114
G115
A/C Compressor Motor Housing
Power Steering Pump Motor Housing

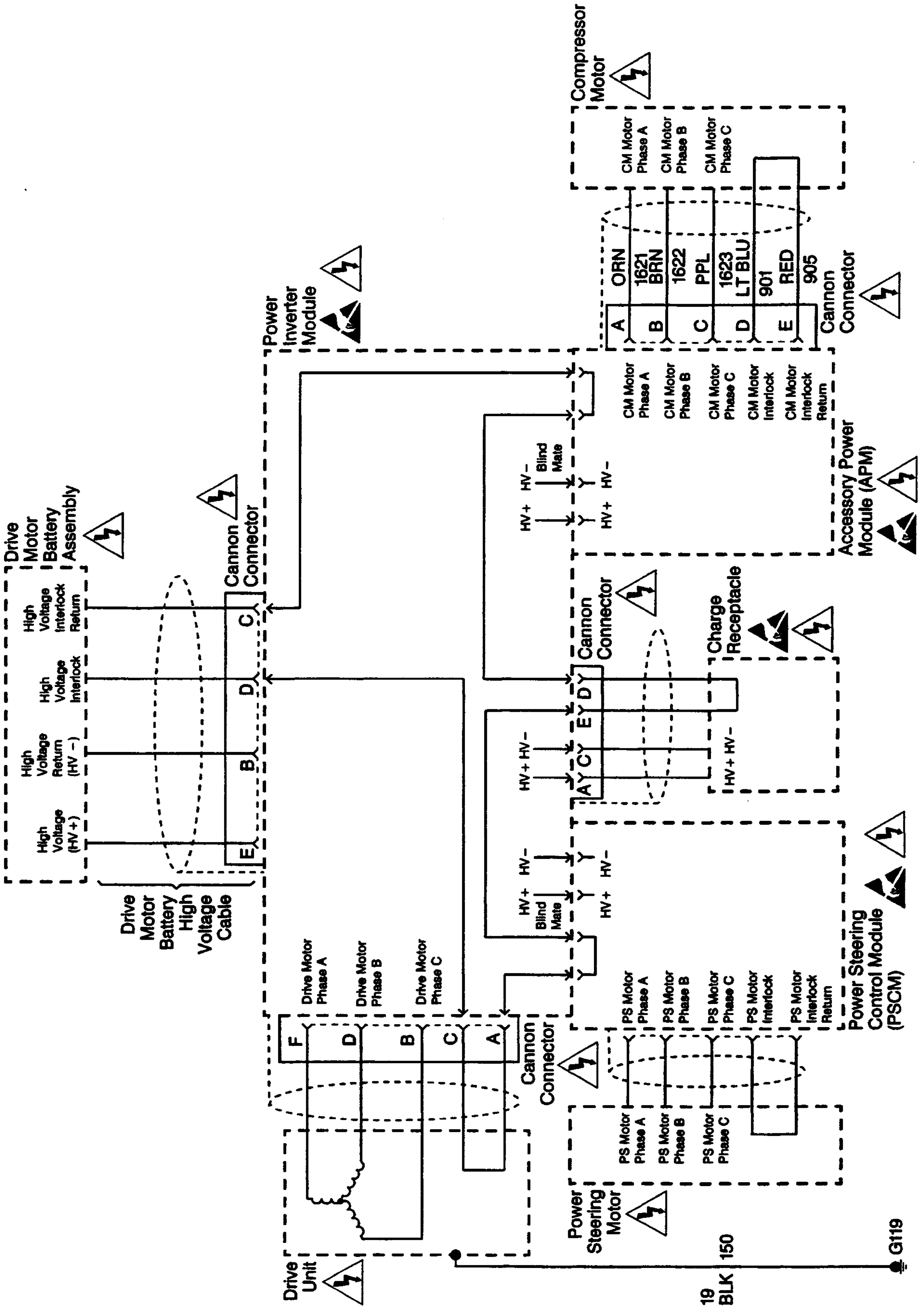
HTCM Diagnostic System Check Schematic Icon Table

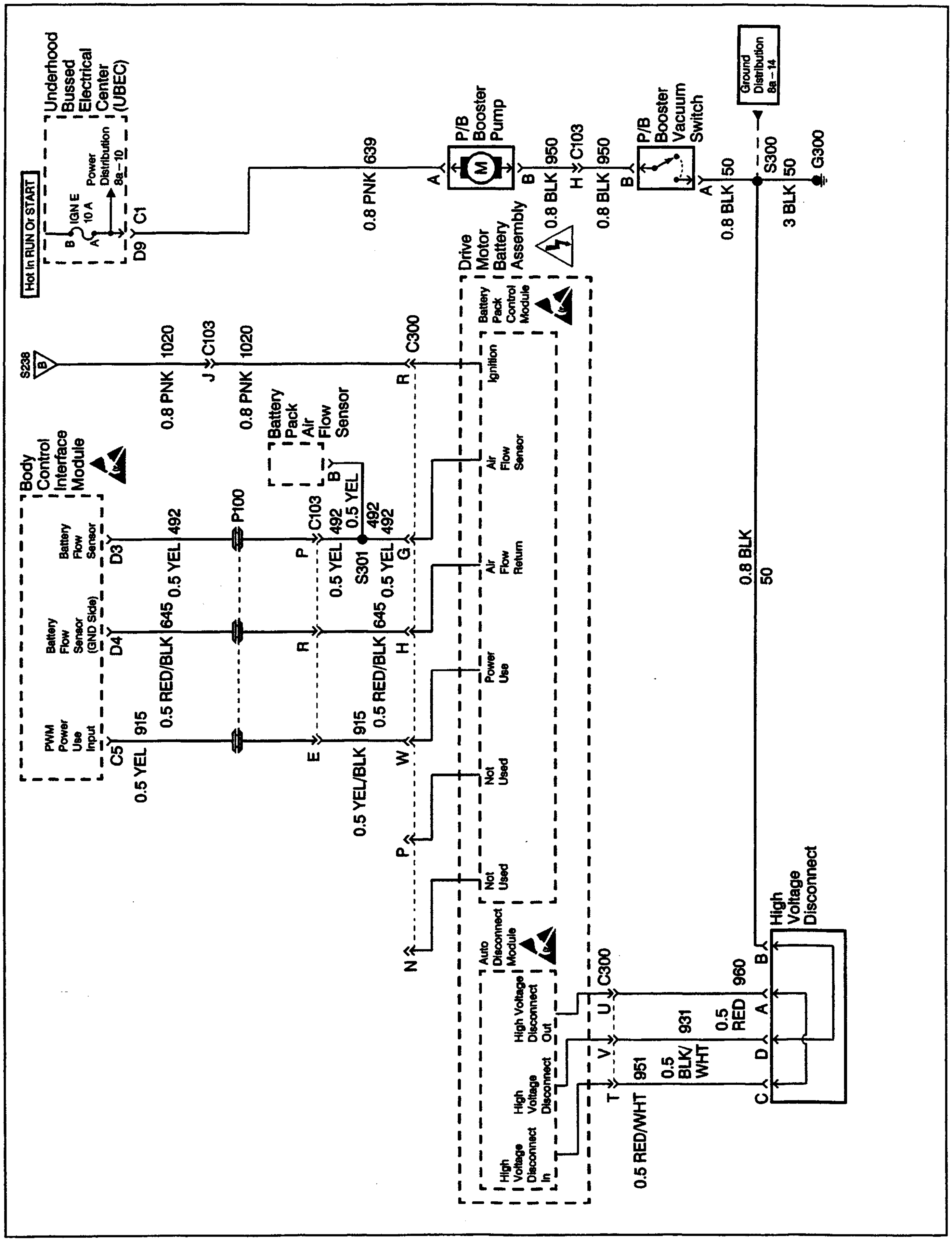
Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

HTCM Diagnostic System Check

Step	Action	Value(s)	Yes	No
1	1. Turn the key to the RUN position. 2. Observe the SERVICE SOON indicator lamp. Does the SERVICE SOON indicator turn ON for 3 to 5 seconds and then go OFF or stay on constantly?	—	Go to Step 2	Go to *No SERVICE SOON Indicator Lamp* table in *Drive Motor Controls - Section 6A*
2	Using the a scan tool, attempt to communicate with the HTCM. **Important:** Charge paddle must not be inserted into the charge receptacle. Remove if inserted. Does the a scan tool display data from the HTCM?	—	Go to Step 3	Go to *No Serial Data* table in *Section 6 No Serial Data - Section 6A*
3	Check for any stored DTCs. Are there any DTCs stored in memory?	—	Go to the Appropriate DTC table	Go to Step 4
4	Operate the A/C and/or Heat mode. Are there symptoms present with the A/C and/or heating system that need diagnosing?	—	Go to the *HTCM Diagnostic* Symptom Test following the DTC diagnostic section in this manual.	System OK

High Voltage Disable Procedure


Drive Motor Battery Assembly
High Voltage (HV+)
High Voltage Return (HV –)
High Voltage Interlock
High Voltage Interlock Return
Drive Motor Battery High Voltage Cable
Cannon Connector
E
B
D
C
Power Inverter Module
Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
ORN
1621 BRN
1622 PPL
1623 LT BLU
901 RED
905
A
B
C
D
E
Cannon Connector
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+
HV –
Blind Mate
HV+
HV –
Accessory Power Module (APM)
Cannon Connector
Charge Receptacle
HV+ HV –
HV+ HV –
A
C
E
D
HV+
HV –
Blind Mate
HV+
HV –
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Power Steering Control Module (PSCM)
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19 BLK 150
G119


Hot In RUN Or START
Underhood Bussed Electrical Center (UBEC)
IGN E 10 A
Power Distribution 8a-10
D9
C1
639
0.8 PNK
P/B Booster Pump
950
0.8 BLK
C103
P/B Booster Vacuum Switch
Ground Distribution 8a-14
S300
G300
50
3 BLK
Drive Motor Battery Assembly
Battery Pack Control Module
S238
1020
0.8 PNK
C300
Ignition
Battery Pack Air Flow Sensor
Body Control Interface Module
Battery Flow Sensor
Battery Flow Sensor (GND Side)
PWM Power Use Input
D3
D4
C5
492
0.5 YEL
645
0.5 RED/BLK
915
0.5 YEL/BLK
P100
S301
Air Flow Sensor
Air Flow Return
Power Use
Not Used
Auto Disconnect Module
High Voltage Disconnect Out
High Voltage Disconnect
High Voltage Disconnect In
High Voltage Disconnect
960
0.5 RED
931
0.5 BLK/WHT
951
0.5 RED/WHT
A
B
C
D
E
G
H
J
N
P
R
T
U
V
W

High Voltage Disable Procedure Schematic Reference Table

Reference on Schematic	Location
Ground Distribution	8A-14-0
Power Distribution	8A-10-0

High Voltage Disable Procedure Schematic Icon Table

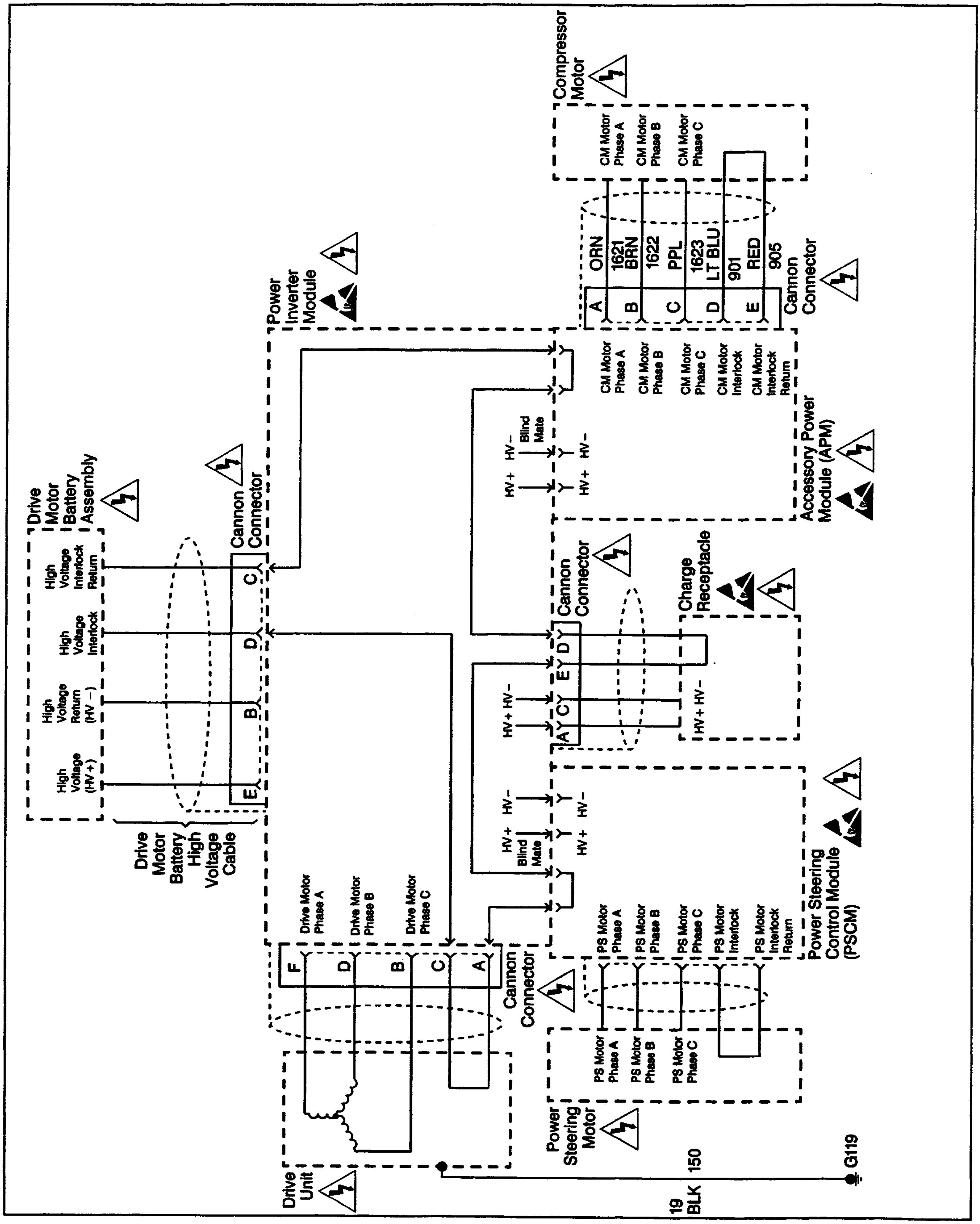
Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

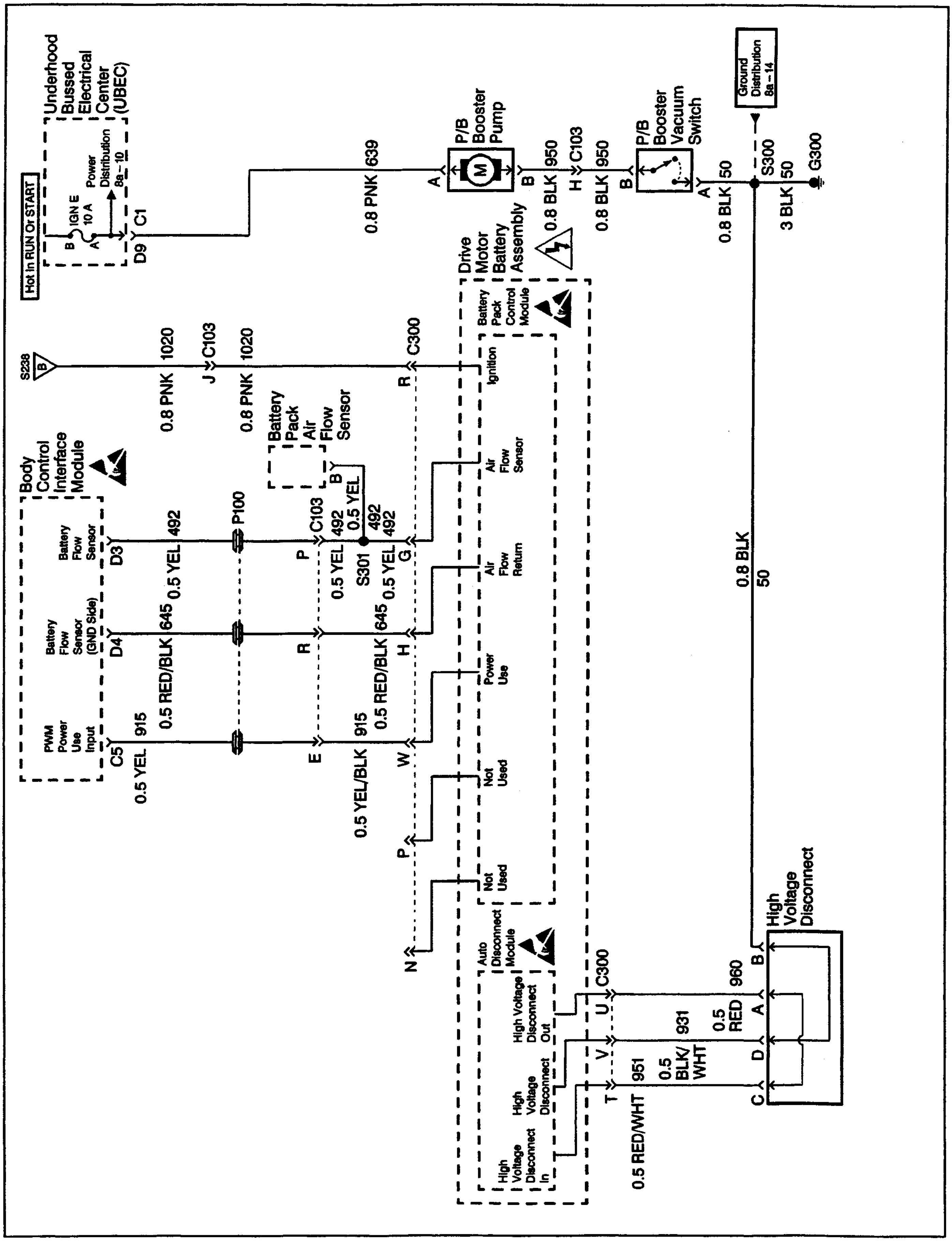
High Voltage Disable Procedure Diagnosis

Step	Action	Value(s)	Yes	No
1	Perform the On-Board Diagnostic (OBD) System Check in *Drive Motor Controls - Section 6A.* *IMPORTANT: The OBD System Check must be performed prior to performing the High Voltage Disable Procedure.* Was the On-Board Diagnostic (OBD) System Check performed?	—	Go to Step 2	Go to *OBD System Check*
2	Was a Drive Motor Control Module DTC 105 present?	—	Go to the DTC 105 diagnostic table in *Drive Motor Controls - Section 6A* first.	Go to Step 3
3	**Notice: During charging, do not remove the high voltage service disconnect. Vehicle damage will result** **CAUTION: To reduce the risk of severe shocks and burns, the High Voltage System should be disabled any time service work is being performed on or around the High Voltage System. The 12-volt system will still be active after the High Voltage system has been disconnected. With the key OFF and the charger disconnected remove the manual high voltage service disconnected** Is the action complete?	—	Go to Step 4	—

Step	Action	Value(s)	Yes	No
4	Turn the key ON and check if the power steering pump runs after the specified time. **Notice: The power steering pump requires 20 seconds to initialize after key up** Did the power steering pump run after the specified time?	20 seconds	Go to Step 6	Go to Step 5
5	**CAUTION: Always treat high voltage cables and connectors as if voltage is present** 1. Remove the battery pack high voltage cannon connector from the back of the Power Inverter Module. 2. Using a DMM probe the two large terminals on the battery pack cable cannon connector. Is the voltage less than the specified value?	5Volts	Go to Step 9	Go to Step 7
6	Did the power steering pump run longer then the specified value?	1 minute	Go to Step 7	Go to Step 8
7	**CAUTION: The Battery pack high voltage system did not power down. The high voltage system still contains high voltage** Internal Battery Pack service is required. Refer to *Battery Pack Service Manual*	—	—	—
8	Replace the Power Inverter Module. Refer to *Power Inverter Module Assembly Removal and Installation* **Notice: If the control module is faulty, the new control module must be programmed.** Refer to *Control Module Programming Procedures - Section 6A.* Is the action complete?	—	Go to Step 8	—
9	Proceed with vehicle service.	—	—	—

High Voltage Enable Procedure

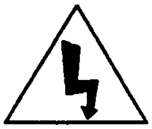

Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
A
B
C
D
E
ORN
1621
BRN
1622
PPL
1623
LT BLU
901
RED
905
Cannon Connector
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+
HV–
Blind Mate
HV+
HV–
Accessory Power Module (APM)
Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV –)
High Voltage (HV+)
Cannon Connector
C
D
B
E
Drive Motor Battery High Voltage Cable
Cannon Connector
D
E
C
A
HV+
HV–
Charge Receptacle
HV+
HV–
HV+
HV–
HV+
Blind Mate
HV–
HV+
HV–
Power Steering Control Module (PSCM)
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19
BLK
150
G119


Hot In RUN Or START
Underhood Bussed Electrical Center (UBEC)
IGN E 10 A
Power Distribution 8a-10
B
A
C1
D9
0.8 PNK 639
P/B Booster Pump
M
A
B
0.8 BLK 950
H
C103
0.8 BLK 950
P/B Booster Vacuum Switch
B
A
0.8 BLK 50
S300
3 BLK 50
G300
Ground Distribution 8a-14
S238
B
0.8 PNK 1020
J
C103
0.8 PNK 1020
R
C300
Drive Motor Battery Assembly
Battery Pack Control Module
Ignition
Air Flow Sensor
Air Flow Return
Power Use
Not Used
Not Used
Battery Pack Air Flow Sensor
B
0.5 YEL
Body Control Interface Module
Battery Flow Sensor
Battery Flow Sensor (GND Side)
PWM Power Use Input
D3
D4
C5
0.5 YEL 492
P100
P
C103
492
492
492
0.5 YEL
S301
0.5 YEL
G
0.5 RED/BLK 645
R
0.5 RED/BLK 645
H
0.5 YEL 915
E
0.5 YEL/BLK 915
W
P
N
0.8 BLK 50
Auto Disconnect Module
High Voltage Disconnect Out
High Voltage Disconnect
High Voltage Disconnect In
C300
U
V
T
0.5 RED 960
0.5 BLK/WHT 931
0.5 RED/WHT 951
High Voltage Disconnect
B
A
D
C

High Voltage Enable Procedure Schematic Reference Table

Reference on Schematic	Location
Ground Distribution	8A-14-0
Power Distribution	8A-10-0

High Voltage Enable Procedure Schematic Icon Table

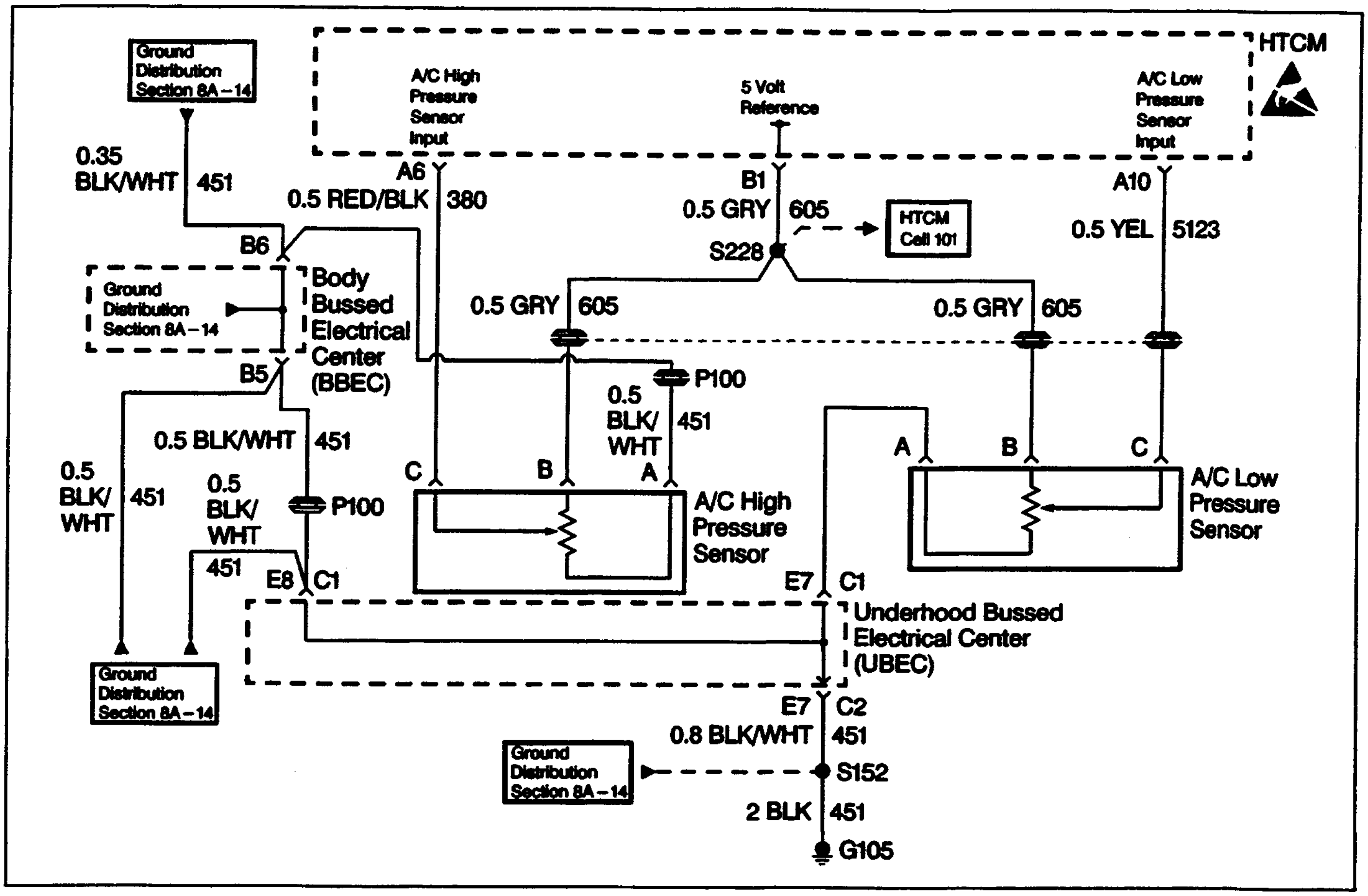
Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

High Voltage Enable Procedure Diagnosis

Step	Action	Value(s)	Yes	No
1	Was the HTCM System Check performed?	—	Go to Step 2	Go to *HTCM System Check*
2	Ensure that all wiring with orange conduit is connected to proper components. Is the action complete?	—	Go to Step 3	—
3	**NOTICE: Do not enable the high voltage system with the charge receptacle. Vehicle damage will result.** Is the action complete?	—	Go to Step 4	
4	Turn the key ON and check each control module for DTC(s). Were any DTC(s) present?	—	Go to appropriate DTC test.	System OK

BLANK

DTC 010 High Pressure Sensor Ckt.


HTCM
A/C High Pressure Sensor Input
5 Volt Reference
A/C Low Pressure Sensor Input
Ground Distribution Section 8A-14
0.35 BLK/WHT 451
A6
0.5 RED/BLK 380
B1
0.5 GRY 605
HTCM Cell 101
S228
A10
0.5 YEL 5123
B6
Body Bussed Electrical Center (BBEC)
B5
0.5 GRY 605
0.5 GRY 605
P100
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
C B A
A/C High Pressure Sensor
A B C
A/C Low Pressure Sensor
E8 C1
E7 C1
Underhood Bussed Electrical Center (UBEC)
E7 C2
0.8 BLK/WHT 451
S152
2 BLK 451
G105

DTC 011 HIGH PRESSURE SENSOR CKT.

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors input from the transducers. The sensor can measure a range from 0.23 volts (20kPa) to 4.9 volts (2800 kPa). If the input goes outside the normal range, this fault will be set and the heat pump will be disabled

DTC Parameters

DTC10 will set if:

- Open or short to ground or voltage in the high side transducer circuit.
- Faulty transducer
- HTCM failure

DTC 10 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts or more than 4.9 volts on the high side transducer input circuit.

Failure Action

Heat pump operation will be disabled.

Related DTCs

HTCM 053

Telltale Illuminated

None

Other Controller Interfaces

None

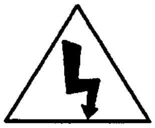
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 010 High Pressure Sensor Ckt. Schematic Reference Table

Reference on Schematic	Location
HTCM	Section 1B1
Ground Distribution	8A-14-0

DTC 010 High Pressure Sensor Ckt. Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 010 High Pressure Sensor Ckt. Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	Are HTCM DTC(s) 11 or 24 also set?	—	Go to Step 3	Go to Step 9
3	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Do the HTCM DTC's 10, 11, or 24 reset?	—	Go to Step 4	Problem is intermittent. Refer to Diagnostic Aids
4	Using a digital multimeter, backprobe CKT 605 (GRY) wire between HTCM connector C1 cavity B1 and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 5	Go to Step 6
5	Locate and repair open CKT 605 (GRY) wire between HTCM and S228. Is the action complete?	—	Go to Step 21	—
6	1. Turn ignition OFF. 2. Disconnect HTCM C1 connector. 3. Connect a digital multimeter between CKT 605 (GRY) wire connector C1 cavity B1 at HTCM connector and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 7	Go to Step 8
7	Locate and repair short to ground in CKT 605 (GRY) wire Is the action complete?	—	Go to Step 21	—

Step	Action	Value(s)	Yes	No
8	Replace HTCM. Is the action complete?	—	Go to Step 21	—
9	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Does DTC 010 reset?	—	Go to Step 10	Problem is intermittent. Refer to Diagnostic Aids
10	1. Disconnect A/C high pressure sensor 2. Select A/C High Side Pressure on a scan tool. Does a scan tool indicate A/C High Side Pressure at the specified value?	0 kPa	Go to Step 12	Go to Step 11
11	Locate and repair short to voltage in CKT 380 (RED/BLK) wire Is the action complete?	—	Go to Step 21	—
12	Connect a jumper between CKT 380 (RED/BLK) wire and CKT 605 (GRY) wire at A/C high pressure sensor connector. Does a scan tool indicate A/C High Side Pressure at the specified value?	5100 kPa	Go to Step 13	Go to Step 14
13	Replace A/C high pressure sensor. Is the action complete?	—	Go to Step 21	—
14	Connect a digital multimeter between CKT 605 (GRY) wire and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 16	Go to Step 15
15	Locate and repair open CKT 605 (GRY) wire between A/C high pressure sensor and S228. Did you complete the wire repair?	—	Go to Step 21	—
16	1. Disconnect HTCM C1 connector. 2. Connect a digital multimeter between CKT 380 (RED/BLK) wire at HTCM cavity A6 connector C1 and CKT 380 (RED/BLK) wire at A/C high pressure sensor connector. Is the resistance less than the specified value?	5.0 Ω	Go to Step 18	Go to Step 17
17	Locate and repair open CKT 380 (RED/BLK) wire. Is the action complete?	—	Go to Step 21	—
18	Connect a digital multimeter between CKT 380 (RED/BLK) wire and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 19	Go to Step 20
19	Locate and repair short to ground in CKT 380 (RED/BLK) wire. Is the action complete?	—	Go to Step 21	—
20	Replace HTCM. Is the action complete?	—	Go to Step 21	—
21	Install removed connectors and components. Clear all DTC(s).	—	System OK	—

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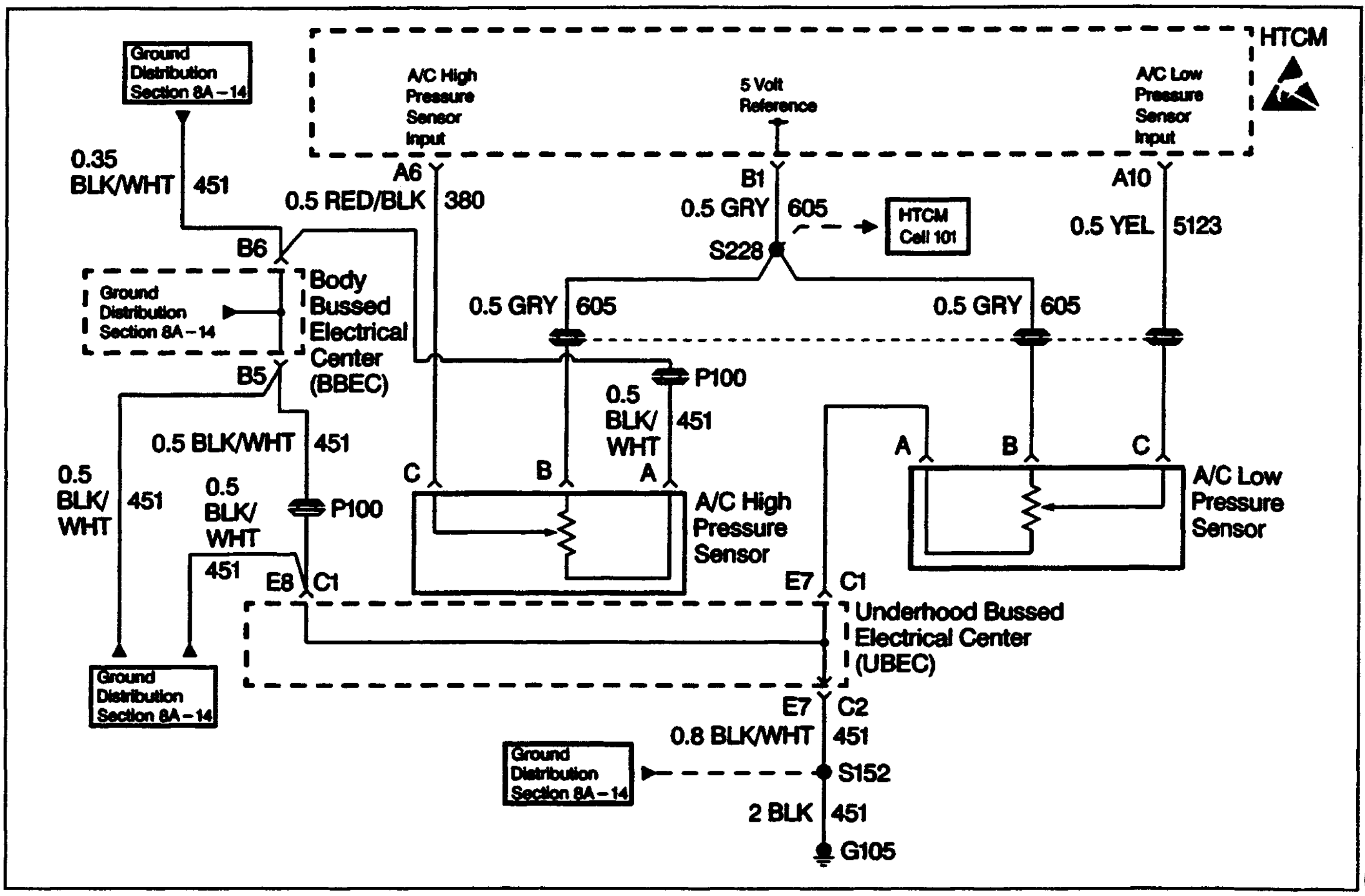
DTC 011 Low Pressure Sensor Ckt.


HTCM
Ground Distribution Section 8A-14
A/C High Pressure Sensor Input
5 Volt Reference
A/C Low Pressure Sensor Input
0.35 BLK/WHT 451
A6
0.5 RED/BLK 380
B1
0.5 GRY 605
HTCM Cell 101
S228
A10
0.5 YEL 5123
B6
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
B5
0.5 GRY 605
0.5 GRY 605
P100
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT
P100
451
C
B
A
A/C High Pressure Sensor
A
B
C
A/C Low Pressure Sensor
E8
C1
E7
C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A-14
E7
C2
0.8 BLK/WHT 451
Ground Distribution Section 8A-14
S152
2 BLK 451
G105

DTC 011 Low Pressure Sensor Ckt.

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors input from the transducers. The sensor operating range is 0.2 volts (30 kPa) to 4.9 volts (671 kPa). If the input goes below the normal range, this fault will be set and the heat pump will be disabled.

DTC Parameters

DTC11 will set if:

- Open or short to ground or voltage in the high side transducer circuit.
- Faulty transducer
- HTCM failure

DTC 11 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.10 volts on the Low Side transducer input circuit. The HTCM will not detect a short to voltage since normal operating pressures may cause the transducer to indicate 5.0 volts.

Failure Action

Heat pump operation will be disabled.

Related DTCs

HTCM 052

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 011 Low Pressure Sensor Ckt. Schematic Reference Table

Reference on Schematic	Location
HTCM	Section 1B1
Ground Distribution	8A-14-0

DTC 011 Low Pressure Sensor Ckt. Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 011 Low Pressure Sensor Ckt. Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	Are HTCM DTC(s) 10 or 24 also set?	—	Go to Step 3	Go to Step 9
3	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Do the HTCM DTC's 10, 11, or 24 reset?	—	Go to Step 4	Problem is intermittent. Refer to Diagnostic Aids
4	Using a digital multimeter, backprobe CKT 605 (GRY) wire between HTCM connector C1 cavity B1 and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 5	Go to Step 6
5	Locate and repair open CKT 605 (GRY) wire between HTCM and S228. Is the action complete?	—	Go to Step 21	—
6	1. Turn ignition OFF. 2. Disconnect HTCM C1 connector. 3. Connect a digital multimeter between CKT 605 (GRY) wire connector C1 cavity B1 at HTCM connector and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 7	Go to Step 8

Step	Action	Value(s)	Yes	No
7	Locate and repair short to ground in CKT 605 (GRY) wire Is the action complete?	—	Go to Step 21	—
8	Replace HTCM. Is the action complete?	—	Go to Step 21	—
9	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Does DTC 011 reset?	—	Go to Step 10	Problem is intermittent. Refer to Diagnostic Aids
10	1. Disconnect A/C low pressure sensor 2. Select A/C low side pressure on a scan tool. Does a scan tool indicate A/C low side pressure at the specified value?	0 kPa	Go to Step 12	Go to Step 11
11	Locate and repair short to voltage in CKT 5123 (YEL) wire Is the action complete?	—	Go to Step 21	—
12	Connect a jumper between CKT 5123 (YEL) wire and CKT 605 (GRY) wire at A/C low pressure sensor connector. Does a scan tool indicate A/C low side pressure at the specified value?	690 kPa	Go to Step 13	Go to Step 14
13	Replace A/C low pressure sensor. Is the action complete?	—	Go to Step 21	—
14	Connect a digital multimeter between CKT 605 (GRY) wire and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 16	Go to Step 15
15	Locate and repair open CKT 605 (GRY) wire between A/C low pressure sensor and S228. Did you complete the wire repair?	—	Go to Step 21	—
16	1. Disconnect HTCM C1 connector. 2. Connect a digital multimeter between CKT 5123 (YEL) wire at HTCM cavity A10 connector C1 and CKT 5123 (YEL) wire at A/C low pressure sensor connector. Is the resistance less than the specified value?	5.0 Ω	Go to Step 18	Go to Step 17
17	Locate and repair open CKT 5123 (YEL) wire. Is the action complete?	—	Go to Step 21	—
18	Connect a digital multimeter between CKT 5123 (YEL) wire and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 19	Go to Step 20
19	Locate and repair short to ground in CKT 5123 (YEL) wire. Is the action complete?	—	Go to Step 21	—
20	Replace HTCM. Is the action complete?	—	Go to Step 21	—
21	Install removed connectors and components. Clear all DTC(s).	—	System OK	—

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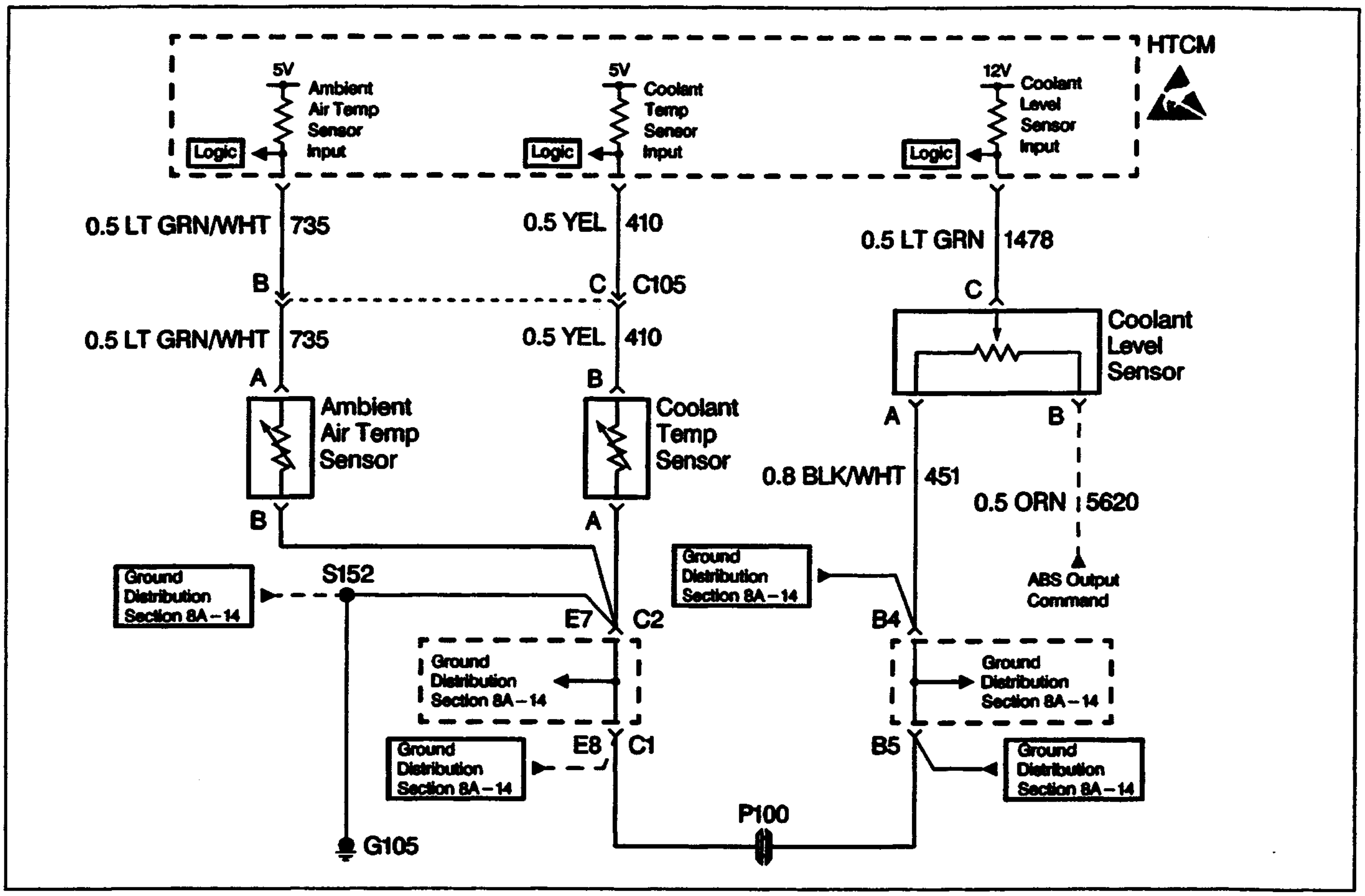
DTC 014 Pump Coolant Temp. Sensor Ckt.


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
0.5 YEL 410
0.5 LT GRN 1478
B
C
C105
C
0.5 LT GRN/WHT 735
0.5 YEL 410
Coolant Level Sensor
A
B
Ambient Air Temp Sensor
Coolant Temp Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
B
A
ABS Output Command
Ground Distribution Section 8A-14
S152
E7
C2
B4
E8
C1
B5
P100
G105

DTC 014 Pump Coolant Temp. Sensor Ckt.

The temperature sensors are the thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The heat pump ventilation system (HPVS)/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC Parameters

DTC14 will set if:

- Short to ground in the pump coolant temperature sensor circuit.
- Faulty sensor.
- HTCM failure

DTC 14 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

Failure Action

The SERVICE SOON light will be turned ON. The front end fan and coolant pump will be commanded to high speed, the charge receptacle coolant valve will be commanded to the radiator position, and regen will be disabled.

Related DTCs

HTCM 47, HTCM 51

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

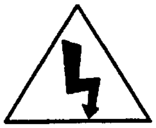
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 014 Pump Coolant Temp. Sensor Ckt. Schematic Reference Table

Reference on Schematic	Location
Ground Distribution	8A-14-0

DTC 014 Pump Coolant Temp. Sensor Ckt. Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 014 Pump Coolant Temp. Sensor Ckt. Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 3	Problem is intermittent. Refer to Diagnostic Aids
3	1. Disconnect coolant temperature sensor. 2. Select Coolant Temperature on a scan tool. Does a scan tool indicate Coolant Temperature at the specified value?	-40° F	Go to Step 5	Go to Step 4
4	Locate and repair short to ground in CKT 410 (YEL) wire Is the action complete?	—	Go to Step 12	—
5	Connect a jumper between CKT 410 (YEL) wire and CKT 451 (BLK/WHT) wire at coolant temperature sensor connector. Does a scan tool indicate Coolant Temperature at the specified value?	212° F	Go to Step 6	Go to Step 7
6	Replace coolant temperature sensor. Is the action complete?	—	Go to Step 12	—
7	Connect a jumper between CKT 410 (YEL) wire at coolant temperature sensor connector and ground. Does a scan tool indicate Coolant Temperature at the specified value?	212° F	Go to Step 8	Go to Step 9

Step	Action	Value(s)	Yes	No
8	Locate and repair open CKT 451 (BLK/WHT) wire. Is the action complete?	—	Go to Step 12	—
9	1. Disconnect HTCM C1 connector 2. Connect a digital multimeter between CKT 410 (YEL) wire at HTCM cavity A12 and CKT 410 (YEL) wire at coolant temperature sensor Is the resistance less than the specified value?	5.0 Ω	Go to Step 10	Go to Step 11
10	Replace HTCM. Is the action complete?	—	Go to Step 12	—
11	Locate and repair open CKT 410 (YEL) wire. Is the action complete?	—	Go to Step 12	—
12	Install removed components and connectors. Clear DTC(s).	—	System OK	—

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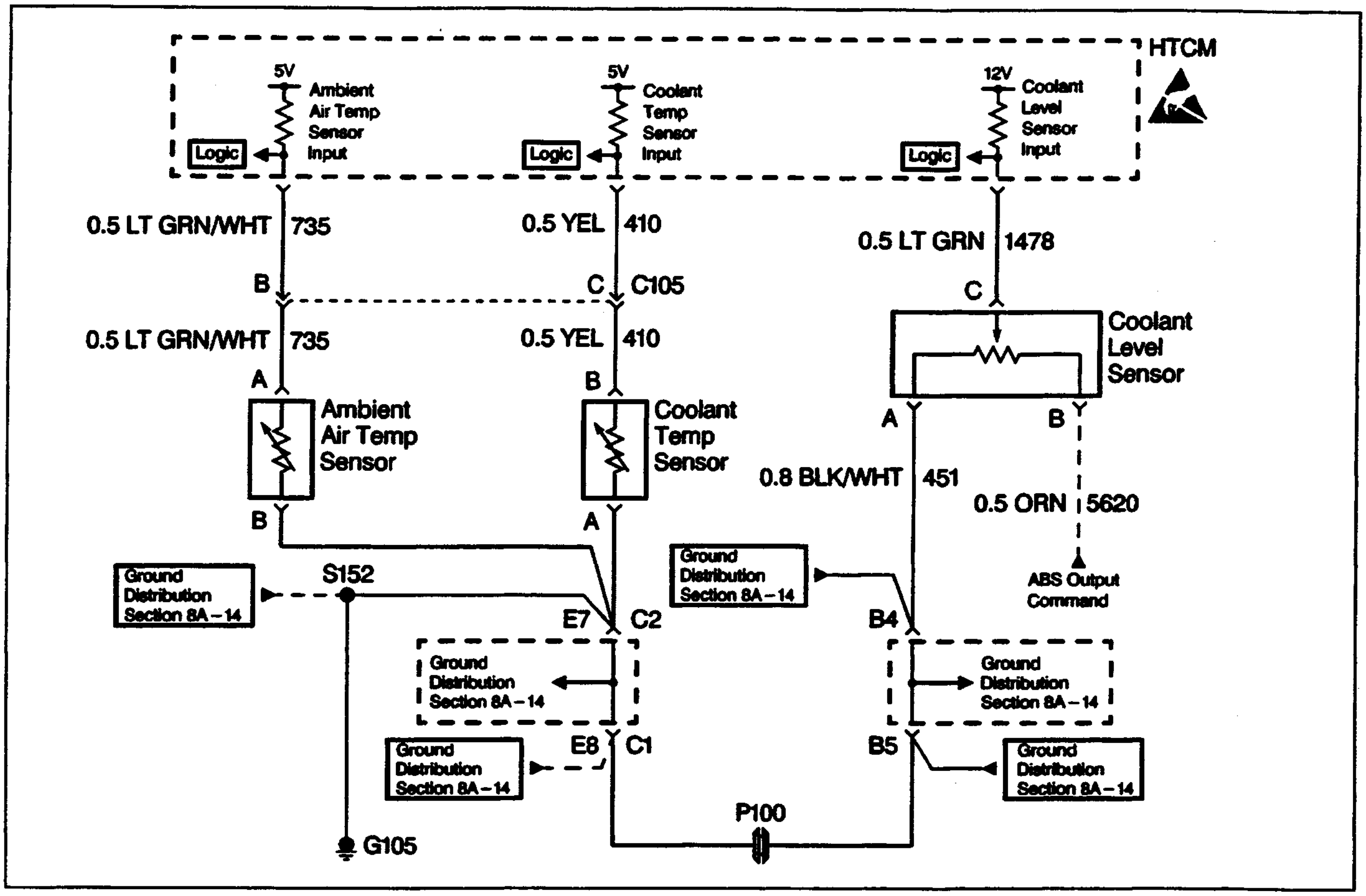
DTC 016 Ambient Air Temperature Ckt.


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
0.5 YEL 410
0.5 LT GRN 1478
B
C
C105
C
0.5 LT GRN/WHT 735
0.5 YEL 410
Coolant Level Sensor
A
B
Ambient Air Temp Sensor
Coolant Temp Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
B
A
ABS Output Command
Ground Distribution Section 8A-14
S152
E7
C2
Ground Distribution Section 8A-14
B4
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
E8
C1
B5
Ground Distribution Section 8A-14
P100
G105

DTC 016 Ambient Air Temperature Ckt.

The temperature sensors are thermistors that change resistance that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The heat pump ventilation system (HPVS)/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the measured input goes outside the normal operating range, this fault will be set.

DTC Parameters

DTC16 will set if:

- Short to ground in the OTS circuit.
- Faulty sensor.
- HTCM failure

DTC 16 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects input voltage less than 0.06 volts. An open condition cannot be detected because of the overlap between normal operating voltage and open circuit voltage.

Failure Action

The SERVICE SOON light will be turned ON. Compressor will operate in either heat or cool mode regardless of ambient temperature.

Related DTCs

HTCM 52

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

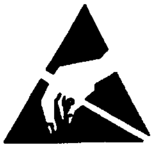
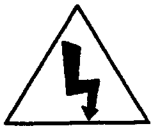
When attempting to diagnose an intermittent problem, use a scan tool and review malfunction history diagnostic information. This data can be used to determine the conditions that were present when the DTC set.

- Select Malf History from a scan tool HTCM menu. Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 016 Ambient Air Temperature Ckt. Schematic Reference Table

Reference on Schematic	Location
Ground Distribution	8A-14-0

DTC 016 Ambient Air Temperature Ckt. Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.
	This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.*

DTC 016 Ambient Air Temperature Ckt. Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 3	Problem is intermittent. Refer to Diagnostic Aids
3	1. Disconnect ambient air temperature sensor. 2. Select Ambient Air Temperature on a scan tool. Does a scan tool indicate Ambient Air Temperature at the specified value?	66° F	Go to Step 5	Go to Step 4
4	Locate and repair short to ground in CKT 735 (LT GRN/WHT) wire Is the action complete?	—	Go to Step 12	—
5	Connect a jumper between CKT 735 (LT GRN/WHT) wire and CKT 451 (BLK/WHT) wire at ambient air temperature sensor connector. Does a scan tool indicate Ambient Air Temperature at the specified value?	140° F	Go to Step 6	Go to Step 7
6	Replace ambient air temperature sensor. Is the action complete?	—	Go to Step 12	—

Step	Action	Value(s)	Yes	No
7	Connect a jumper between CKT 735 (LT GRN/WHT) wire at ambient air temperature sensor connector and ground. Does a scan tool indicate Ambient Air Temperature at the specified value?	140° F	Go to Step 8	Go to Step 9
8	Locate and repair open CKT 451 (BLK/WHT) wire. Is the action complete?	—	Go to Step 12	—
9	1. Disconnect HTCM C1 connector 2. Connect a digital multimeter between CKT 735 (LT GRN/WHT) wire at HTCM cavity A7 and CKT 735 (LT GRN/WHT) wire at ambient air temperature sensor Is the resistance less than the specified value?	5.0 Ω	Go to Step 10	Go to Step 11
10	Replace HTCM. Is the action complete?	—	Go to Step 12	—
11	Locate and repair open CKT 735 (LT GRN/WHT) wire. Is the action complete?	—	Go to Step 12	—
12	Install removed components and connectors. Clear DTC(s).	—	System OK	—

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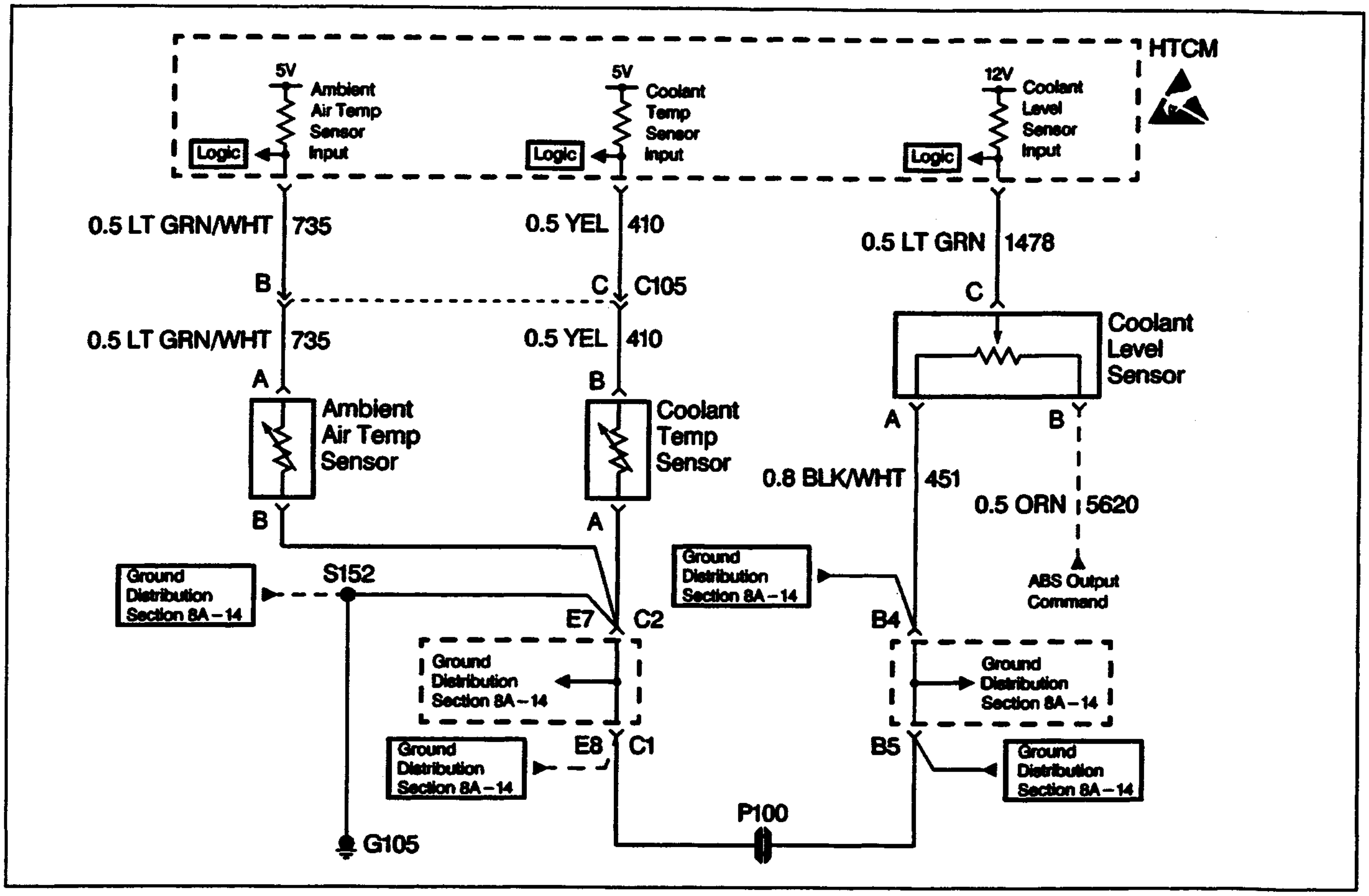
DTC 017 Coolant Level Sensor (CLS)


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
0.5 YEL 410
0.5 LT GRN 1478
B
C C105
C
0.5 LT GRN/WHT 735
0.5 YEL 410
Coolant Level Sensor
A
B
Ambient Air Temp Sensor
Coolant Temp Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
B
A
ABS Output Command
Ground Distribution Section 8A-14
S152
E7 C2
B4
E8 C1
B5
P100
G105

DTC 017 Coolant Level Sensor (CLS)

The coolant level switch (CLS) is a smart switch. The switch determines if coolant is present by pulsing a light emitting diode into the coolant, and monitoring its reflection with a phototransistor. The CLS contains filtering to prevent false detection of low coolant. On power up, the CLS drives its output low, then high. If the heat pump ventilation system (HPVS)/thermal control module (HTCM) does not detect this initialization test, this fault will be set. If the CLS input circuit fails after startup, an HTCM DTC 54 will be set.

DTC Parameters

DTC17 will set if:

- CLS input circuit open or shorted to voltage or ground.
- CLS Run one circuit open or shorted to ground.
- CLS ground circuit open.
- Faulty coolant level switch.
- HTCM failure.

DTC 17 will set when:

When the vehicle is powered up. The CLS performs a power-up initialization test, pulling the circuit low, then high. If the HTCM does not detect this, the test fails and this fault will be logged.

Failure Action

The SERVICE SOON light will be turned ON for the duration of the power cycle and the diagnostic for HTCM DTC 54 (low coolant level) is disabled.

Related DTCs

HTCM 50, 54

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

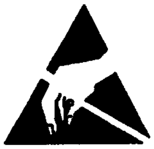
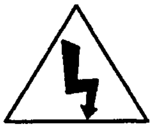
Diagnostic Aids

- This DTC may set falsely if auxiliary battery voltage is low.
- Check the tightness of the female terminal grip with a spare male terminal.
- If the problem is intermittent wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 017 Coolant Level Sensor (CLS) Schematic Reference Table

Reference on Schematic	Location
Ground Distribution	8A-14-0

DTC 017 Coolant Level Sensor (CLS) Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 017 Coolant Level Sensor (CLS) Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	1. Disconnect coolant level sensor. 2. Connect a digital multimeter between CKT 451 (BLK/WHT) wire and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 4	Go to Step 3
3	Locate and repair open CKT 451 (BLK/WHT) wire Is the action complete?	—	Go to Step 14	—
4	1. Connect a digital multimeter between CKT 5620 (ORN) wire and ground. 2. Turn Ignition ON. Is the voltage greater than the specified value?	10 volts	Go to Step 7	Go to Step 5
5	1. Turn ignition off. 2. Disconnect accessory power module 3. Connect a digital multimeter between CKT 5620 (ORN) wire cavity 2 at APM connector and CKT 5620 (ORN) wire at coolant level sensor. Is the resistance less than the specified value?	5.0 Ω	Go to *APM Diagnosis* in *Section 6A*	Go to Step 6
6	Locate and repair open CKT 5620 (ORN) wire. Is the action complete?	—	Go to Step 14	—

Step	Action	Value(s)	Yes	No
7	Connect a digital multimeter between CKT 1478 (LT GRN) wire and ground. Is the voltage greater than the specified value?	10 volts	Go to Step 13	Go to Step 8
8	1. Turn ignition off 2. Disconnect HTCM C1 connector. 3. Connect a digital multimeter between CKT 1478 (LT GRN) wire cavity B8 at HTCM and CKT 1478 (LT GRN) wire at coolant level sensor. Is the resistance less than the specified value?	5.0 Ω	Go to Step 10	Go to Step 9
9	Locate and repair open CKT 1478 (LT GRN) wire. Is the action complete?	—	Go to Step 14	—
10	Connect a digital multimeter between CKT 1478 (LT GRN) wire and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 11	Go to Step 12
11	Locate and repair short to ground in CKT 1478 (LT GRN) wire. Is the action complete?	—	Go to Step 14	—
12	Replace HTCM. Is the action complete?	—	Go to Step 14	—
13	Replace coolant level sensor. Is the action complete?	—	Go to Step 14	—
14	Install removed components and connectors. Clear all DTC(s)	—	System OK	—

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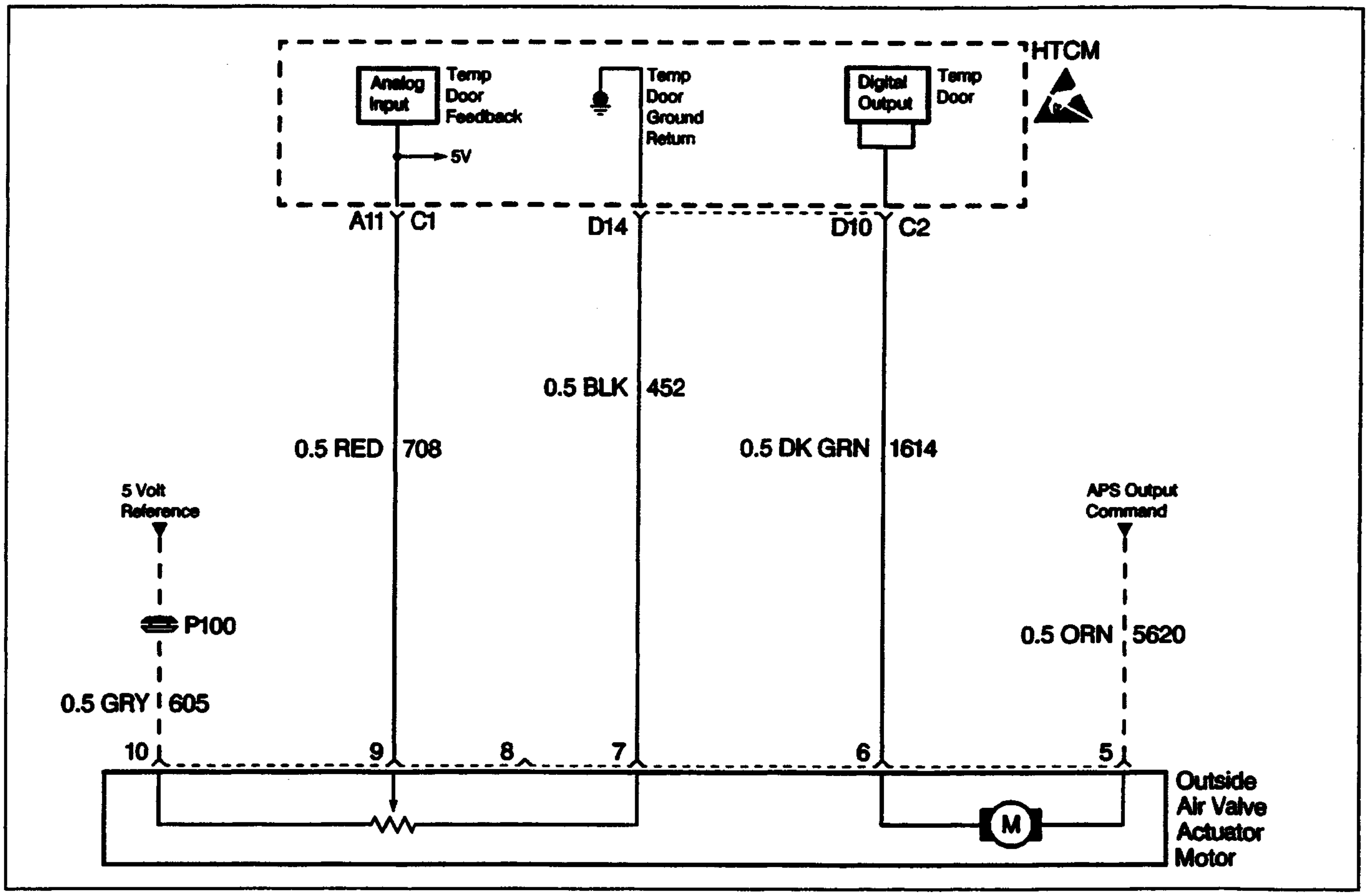
DTC 022 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Circuit


HTCM
Analog Input
Temp Door Feedback
5V
Temp Door Ground Return
Digital Output
Temp Door
A11
C1
D14
D10
C2
0.5 BLK
452
0.5 RED
708
0.5 DK GRN
1614
5 Volt Reference
APS Output Command
P100
0.5 ORN
5620
0.5 GRY
605
10
9
8
7
6
5
M
Outside Air Valve Actuator Motor

DTC 022 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Circuit

The outside air valve actuator position is monitored by the heat pump ventilation system (HPVS)/thermal control module (HTCM) via a Feedback Circuit. If a fault is detected on the feed back input circuit, this fault will be set.

DTC Parameters

DTC22 will set if:

- Open or short to ground or voltage in CKT 708 (RED) wire or open CKT 452 (BLK) wire.
- Faulty outside air valve actuator.
- HTCM failure

DTC 22 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts or more than 4.88 volts on the feedback input circuit.

Failure Action

This DTC will be logged.

Related DTCs

HTCM 10, 11, 62.

Telltale Illuminated

None

Other Controller Interfaces

None

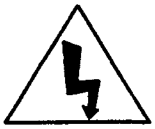
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 022 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Circuit Schematic Reference Table

Reference on Schematic	Location
None	

DTC 022 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Circuit Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 022 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Circuit Diagnosis

Step	Action	Value(s)	Yes	No
1	Did you perform the HTCM Diagnostic System Check?	—	Go to Step 2	Go to the HTCM Diagnostic System Check
2	Are HTCM DTC(s) 10, 11, or 24 also set?	—	Go to Step 3	Go to Step 9
3	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Do the HTCM DTC's 10, 11, or 24 reset?	—	Go to Step 4	Problem is intermittent. Refer to Diagnostic Aids
4	Using a digital multimeter, backprobe CKT 605 (GRY) wire between HTCM connector C1 cavity B1 and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 5	Go to Step 6
5	Locate and repair open CKT 605 (GRY) wire between HTCM and S228. Is the action complete?	—	Go to Step 17	—
6	1. Disconnect HTCM C1 connector. 2. Connect a digital multimeter between CKT 605 (GRY) wire connector C1 cavity B1 at HTCM connector and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 7	Go to Step 8
7	Locate and repair short to ground in CKT 605 (GRY) wire Is the action complete?	—	Go to Step 20	—
8	Replace HTCM. Is the action complete?	—	Go to Step 20	—

Step	Action	Value(s)	Yes	No
9	1. Clear HTCM DTC's 2. Cycle ignition switch OFF and then back ON 3. Read HTCM DTC's Does DTC 022 reset?	—	Go to Step 10	Problem is intermittent. Refer to Diagnostic Aids
10	Backprobe HTCM 24-way connector pin A11 with a digital multimeter. Is the voltage less than the specified value in Run?	0.06 volts	Go to Step 14	Go to Step 11
11	Backprobe HTCM 24-way connector pin A11 with a digital multimeter. Is the voltage more than the specified value in Run?	4.88 volts	Go to Step 12	Go to Step 16
12	1. Disconnect outside air valve actuator. 2. Connect a digital multimeter between CKT 708 (RED) wire cavity 9 at outside air valve actuator connector and ground. Is the voltage more than the specified value in Run?	4.88 volts	Go to Step 17	Go to Step 13
13	Locate and repair open CKT 708 (RED) wire. Did you complete the repair?	—	Go to Step 20	—
14	Disconnect mode valve connector. Backprobe HTCM 24-way connector pin A11 with a digital multimeter. Is the voltage less than the specified value in Run?	0.06 volts	Go to Step 15	Go to Step 19
15	Locate and repair short to ground in CKT 708 (RED) wire. If CKT 708 (RED) is OK, replace HTCM. Did you complete the repair?	—	Go to Step 20	Go to Step 9
16	Replace HTCM. Is the action complete?	—	Go to Step 20	
17	Connect a digital multimeter between CKT 452 (BLK) wire cavity 7 at outside air valve actuator connector and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 19	Go to Step 18
18	Locate and repair open CKT 452 (BLK) wire. Did you complete the repair?	—	Go to Step 20	—
19	Replace outside air valve actuator. Is the action complete?	—	Go to Step 20	
20	Install removed components and connectors. Clear DTC(s).	—		

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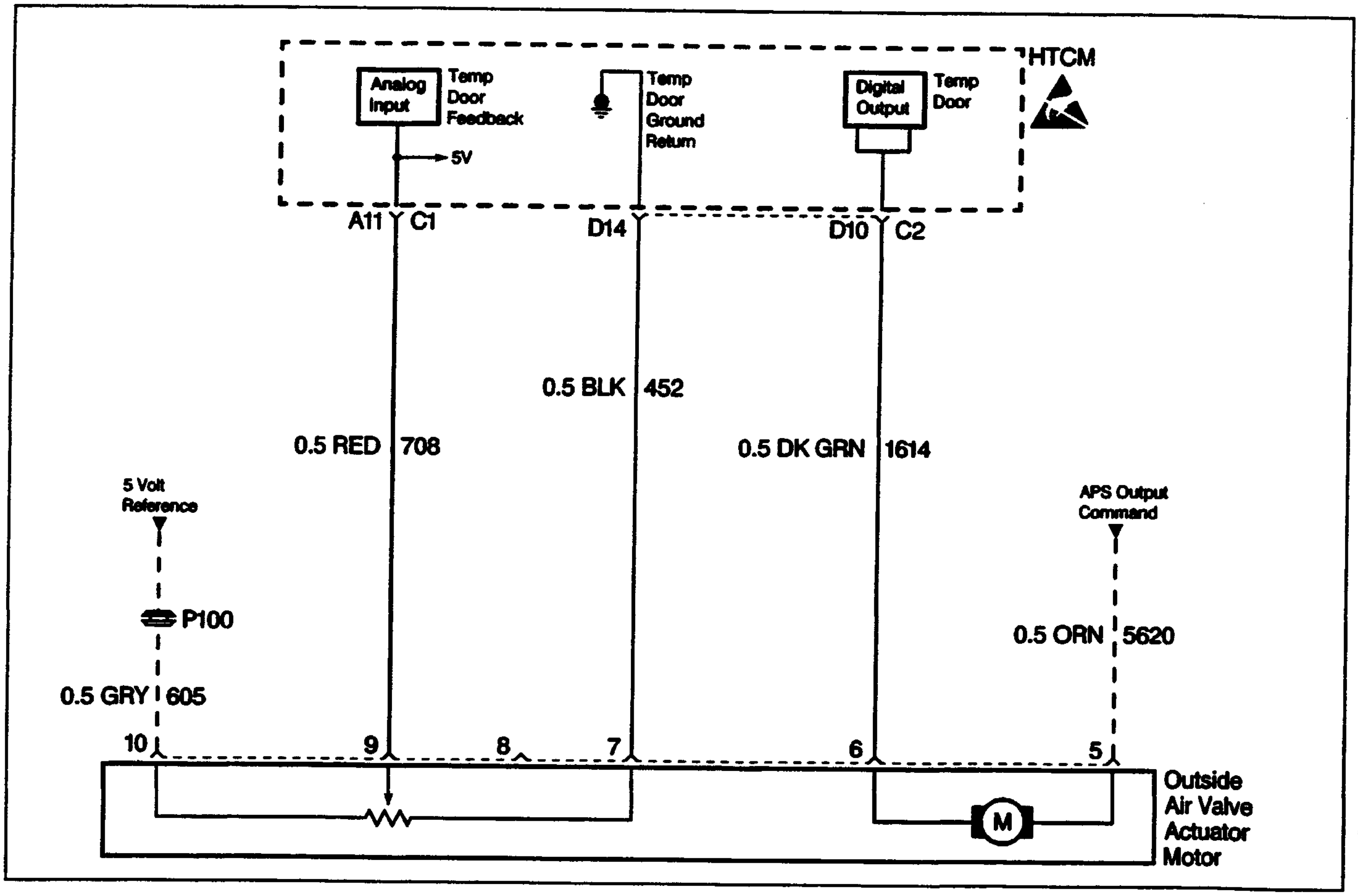
DTC 023 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Out Of Travel Range


HTCM
Analog Input
Temp Door Feedback
5V
Temp Door Ground Return
Digital Output
Temp Door
A11
C1
D14
D10
C2
0.5 BLK
452
0.5 RED
708
0.5 DK GRN
1614
5 Volt Reference
P100
0.5 GRY
605
APS Output Command
0.5 ORN
5620
10
9
8
7
6
5
M
Outside Air Valve Actuator Motor

DTC 023 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Out Of Travel Range Feedback Out Of Travel Range

The outside air valve actuator position is monitored by the heat pump ventilation system (HPVS)/thermal control module (HTCM) via a feedback circuit. If the feedback indicates actuator travel out of range, this fault will be set.

DTC Parameters

DTC23 will set if:

- Mode door actuator power/ground circuit(s) open or shorted to ground.
- Mechanical binding.
- Faulty outside air valve actuator.

DTC 23 will set when:

The first time the HTCM is awake, after losing 12 volt power On this first power up, the HTCM will command the mode valve first to the lower position, then to upper, while monitoring position feedback. This fault exists if the HTCM detects less than 0.20 volts or more than 4.88 volts change between the two positions.

Failure Action

This DTC will be logged.

Related DTCs

HTCM 24

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 023 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Out Of Travel Range Schematic Reference Table

Reference on Schematic	Location
None	

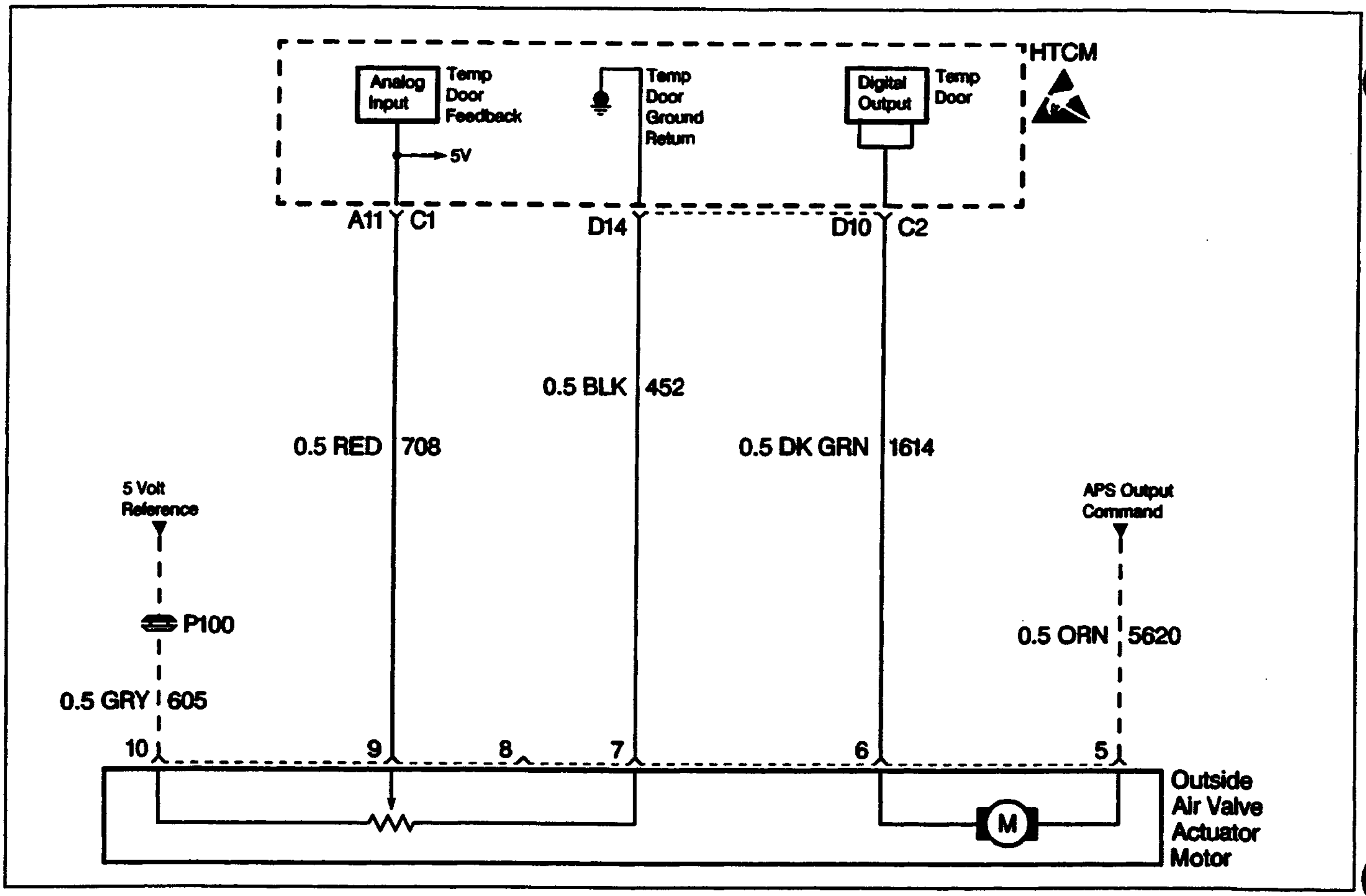
DTC 023 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Out Of Travel Range Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 023 Mode Valve Actuator (Outside Air Valve Actuator) Feedback Out Of Travel Range Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Change paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s)/ Is HTCM DTC 24 set?	—	Go to HTCM DTC 24.	Go to Step 2
2	1. Put vehicle in PARK ignition OFF. 2. Remove auxiliary battery MegaFuse fuse, wait 15 seconds, and then re-install fuse. 3. Wait one minute. 4. Turn ignition ON. Does DTC 023 reset?	—	Go to Step 3	System OK
3	Check mode actuator and door mechanism for binding/misalignment/broken stops. Is the mechanical action of the mode door actuator motor O.K.?	—	Go to Step 5	Go to Step 4
4	Repair or replace mode door actuator mechanism as needed. Is the action complete?	—	Go to Step 6	—
5	Replace HTCM. Is the action complete?	—	Go to Step 6	—
6	Install removed components and connectors. Clear DTC(s).	—		

DTC 024 Mode Valve Actuator (Outside Air Valve Actuator) No Respone


HTCM
Analog Input
Temp Door Feedback
5V
Temp Door Ground Return
Digital Output
Temp Door
A11
C1
D14
D10
C2
0.5 BLK
452
0.5 RED
708
0.5 DK GRN
1614
5 Volt Reference
P100
0.5 GRY
605
APS Output Command
0.5 ORN
5620
10
9
8
7
6
5
M
Outside Air Valve Actuator Motor

DTC 024 Mode Valve Actuator (Outside Air Valve Actuator) No Response

The mode valve actuator (outside air valve actuator) position is monitored by the heat pump ventilation system (HPVS)/thermal control module (HTCM) via a feedback circuit. If the feedback indicates that the actuator did not respond properly to a command, this fault will be set.

DTC Parameters

DTC24 will set if:

- Mode valve actuator (outside air valve actuator) power/ground circuit(s) open or shorted to ground.
- Mechanical binding. Faulty mode valve actuator (outside air valve actuator).

DTC 24 will set when:

Anytime the mode valve feedback indicates that the mode door did not reach the commanded position.

Failure Action

This DTC will be logged

Related DTCs

HTCM 22, 23.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 024 Mode Valve Actuator (Outside Air Valve Actuator) No Response Schematic Reference Table

Reference on Schematic	Location
None	

DTC 024 Mode Valve Actuator (Outside Air Valve Actuator) No Response Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 024 Mode Valve Actuator (Outside Air Valve Actuator) No Response Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). Is DTC 024 current?	—	Go to Step 3	Go to Step 2
2	1. Clear HTCM DTC(s). 2. Select upper air mode, wait 15 seconds. 3. Select lower air mode, wait 15 seconds. Did DTC 024 reset?	—	Go to Step 3	Problem is intermittent. Refer to Diagnostic Aids
3	1. Disconnect air mode door. 2. Connect a digital multimeter between CKT 605 (GRY) wire pin 10 of Mode Valve Actuator (Outside Air Valve Actuator) motor and ground. Is the voltage greater than the specified value?	4.8 volts	Go to Step 5	Go to Step 4
4	Locate and repair open in CKT 605 (GRY) wire If CKT 605 (GRY) wire is OK, replace HTCM. Is the action complete?	—	Go to Step 14	—
5	Connect a digital multimeter between CKT 5620 (ORN) wire pin 5 at Mode Valve Actuator (Outside Air Valve Actuator) motor and ground. Is the voltage equal to the specified value?	Battery voltage	Go to Step 7	Go to Step 6
6	Locate and repair open in CKT 5620 (ORN) wire. Is the action complete?	—	Go to Step 14	—
7	1. **IMPORTANT:** Put vehicle in PARK and turn the ignition OFF. 2. Connect a digital multimeter between CKT 452 (BLK) wire and ground. Is the resistance less than the specified value?	5.0 Ω	Go to Step 9	Go to Step 8

Step	Action	Value(s)	Yes	No
8	Locate and repair open in CKT 452 (BLK) wire If the circuit is OK, replace HTCM. Is the action complete?	—	Go to Step 14	—
9	Connect a digital multimeter between CKT 1614 (DK GRN) wire and ground. Is the resistance less than the specified value?	3000 Ω	Go to Step 10	Go to Step 11
10	Locate and repair short to ground in CKT 1614 (DK GRN) wire. If the circuit is OK, replace HTCM. Is the action complete?	—	Go to Step 14	—
11	Connect a digital multimeter between CKT 1614 (DK GRN) wire and ground. Is the resistance greater than the specified value?	7000 Ω	Go to Step 12	Go to Step 13
12	Locate and repair open in CKT 1614 (DK GRN) wire. If the circuit is OK, replace HTCM. Is the action complete?	—	Go to Step 14	—
13	Replace air mode valve actuator (outside air valve actuator). Is the action complete?	—	System OK	
14	Install removed components and connectors. Clear DTC(s)	—		

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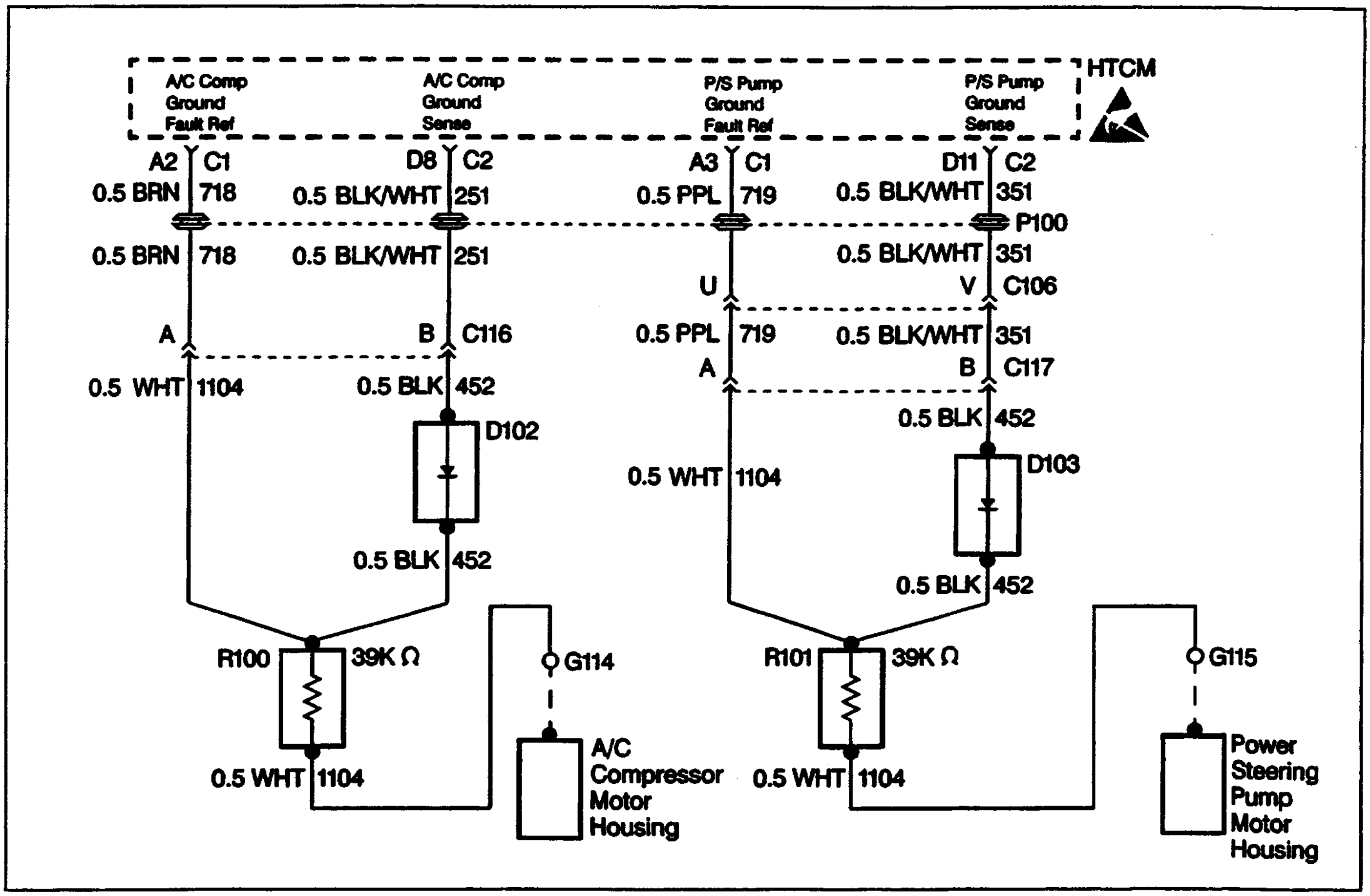
DTC 025 Compressor Motor (CM) Ground Sense Open


HTCM
A/C Comp Ground Fault Ref
A/C Comp Ground Sense
P/S Pump Ground Fault Ref
P/S Pump Ground Sense
A2 C1
D8 C2
A3 C1
D11 C2
0.5 BRN 718
0.5 BLK/WHT 251
0.5 PPL 719
0.5 BLK/WHT 351
P100
0.5 BRN 718
0.5 BLK/WHT 251
0.5 BLK/WHT 351
U
V C106
A
B C116
0.5 PPL 719
0.5 BLK/WHT 351
A
B C117
0.5 WHT 1104
0.5 BLK 452
0.5 BLK 452
D102
D103
0.5 WHT 1104
0.5 BLK 452
0.5 BLK 452
R100 39K Ω
G114
R101 39K Ω
G115
0.5 WHT 1104
A/C Compressor Motor Housing
0.5 WHT 1104
Power Steering Pump Motor Housing

DTC 025 Compressor Motor (CM) Ground Sense Open

The compressor motor (heat pump) is powered by varying A/C voltage. The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors compressor case voltage via the compressor case sense circuit. In the event of the loss of both compressor ground paths or high ground resistance coupled with compressor loss of isolation, the case voltage will rise. When the voltage on the sense line exceeds 1.5 volts DC the HTCM will set this fault and disable the compressor.

DTC Parameters

DTC25 will set if:

- Circuit 718 open
- Ground sensing harness assembly fault.
- Total loss of compressor ground.
- Partial loss of compressor ground, combined with loss of compressor isolation.
- HTCM fault.

DTC 25 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects voltage greater than 1.5 volts DC at the compressor motor case sense input.

Failure Action

This DTC will be logged, the compressor will be disabled, and the SERVICE SOON telltale will be turned ON.

Related DTCs

HTCM DTCs 26, 40

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

If the problem is not resolved by using the trouble tree, try spraying the compressor, ground sensing harness, and connectors with salt water, then step through the trouble tree again. Check the tightness of the female terminal grip with a spare male terminal. Check continuity of CKT 251 (BLK/WHT) wire between A/C compressor ground shield and HTCM cavity D connector C2. Check for short to voltage on CKT 718 (BRN) wire. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 025 Compressor Motor (CM) Ground Sense Open Schematic Reference Table

Reference on Schematic	Location
None	

DTC 025 Compressor Motor (CM) Ground Sense Open Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A–3–0.**
⚡	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 025 Compressor Motor (CM) Ground Sense Open Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 2	Problem is intermittent. Refer to Diagnostic Aids
2	1. **CAUTION: REFER TO HIGH VOLTAGE DISABLE IN THIS MANUAL AND DISABLE HIGH VOLTAGE. VEHICLE OFF, CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DMM TO OHMS AND CONNECT DMM TO TESTER** 2. Apply A/C voltage to the compressor motor . Refer to Insulation Test Procedure in Section 1B. Is the reading less than the specified value?	5.0 M Ω	Go to Step 9	Go to Step 3
3	Connect a digital multimeter between the compressor ground shield and the compressor body. Is the resistance less than the specified value?	1.0 Ω	Go to Step 4	Go to Step 9
4	1 Place vehicle in park and turn the ignition to the OFF position. 2. Inspect the compressor ground cable. Is the ground cable damaged of disconnected?	—	Go to Step 5	Go to Step 6
5	Reconnect or replace ground cable.	—	Go to Step 11	—

Step	Action	Value(s)	Yes	No
6	1. Disconnect C116. 2. Turn ignition to the RUN position. 3. Connect a digital multimeter between harness side of C116 pin A and ground. Is the voltage less that the specified value?	4.5 volts	Go to Step 7	Go to Step 8
7	Locate and repair open CKT 718 (BRN) wire. If CKT 718 (BRN) wire is OK, replace HTCM Did you complete the repair?	—	Go to Step 11	—
8	Connect a digital multimeter between CKT 718 (BRN) wire pin A at the compressor side of C116 and the A/C compressor motor housing. Is the resistance between the specified values?	35K and 45K Ω	Go to Step 10	Go to Step 9
9	Replace compressor motor. Is the action complete?	—	Go to Step 11	
10	Check all connections. If no trouble found, refer to *Diagnostic Aids*	—	Go to Step 11	
11	Replaced all removed components or connectors. Clear DTC(s).	—	System OK	

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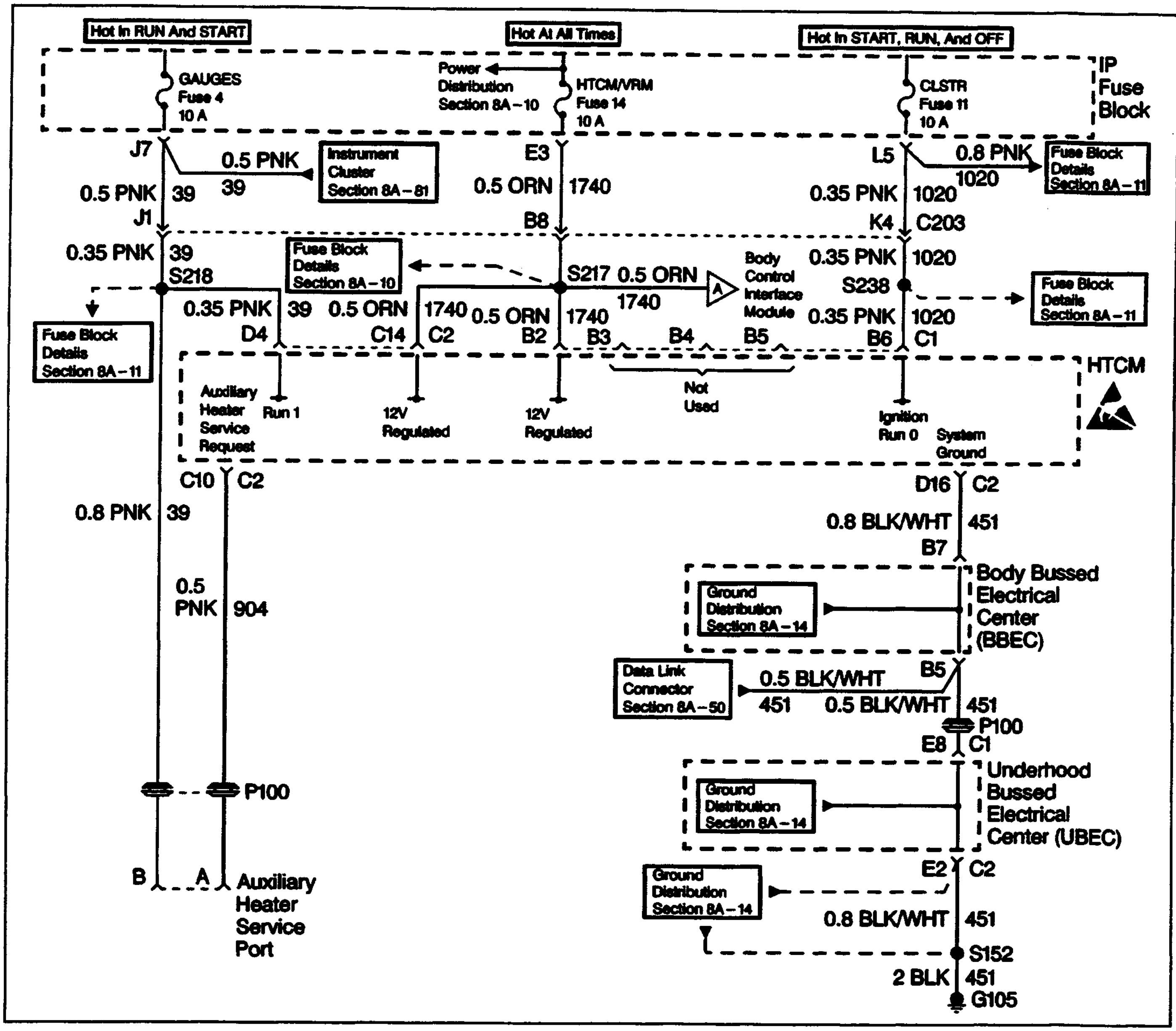
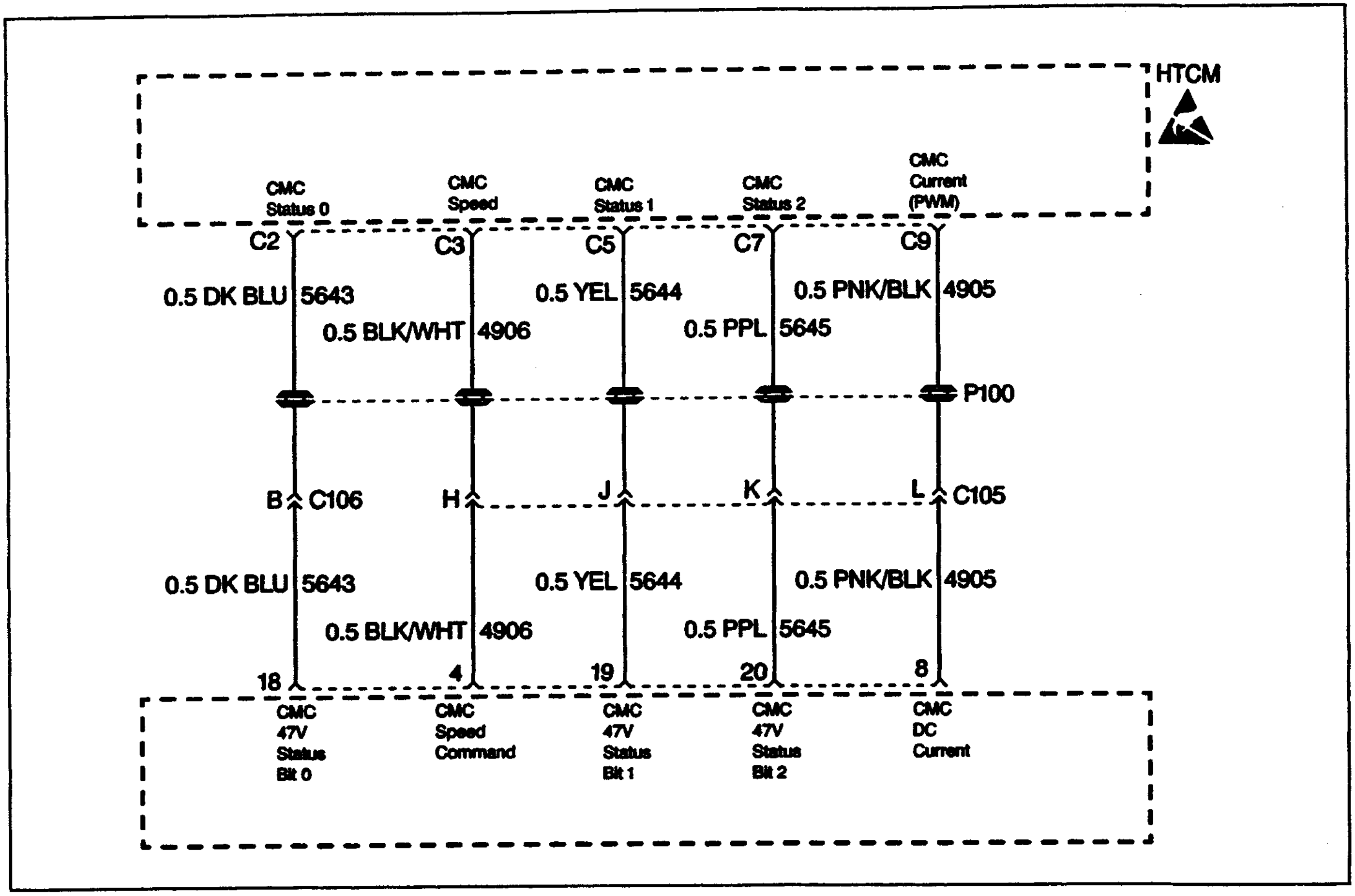
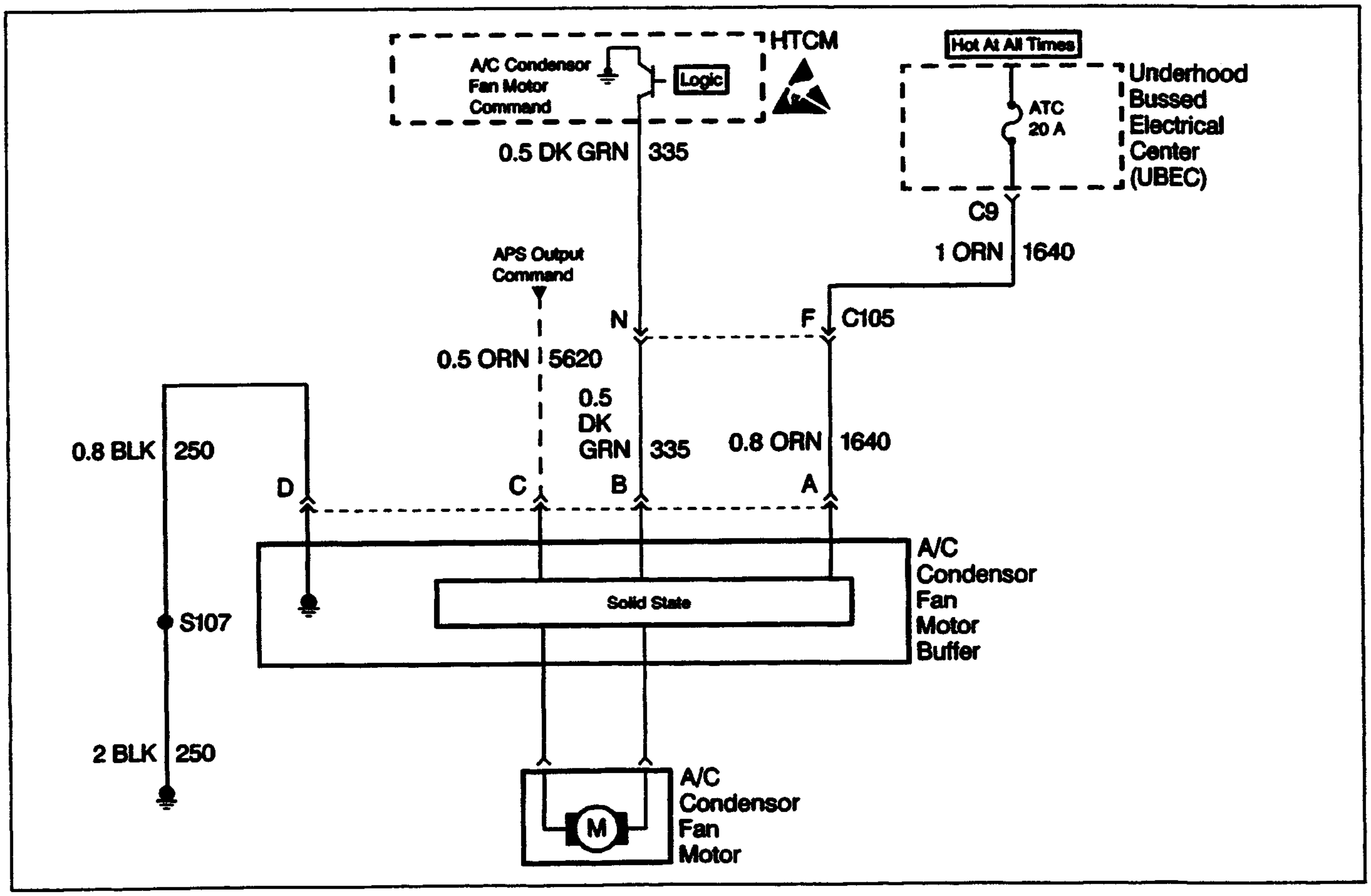
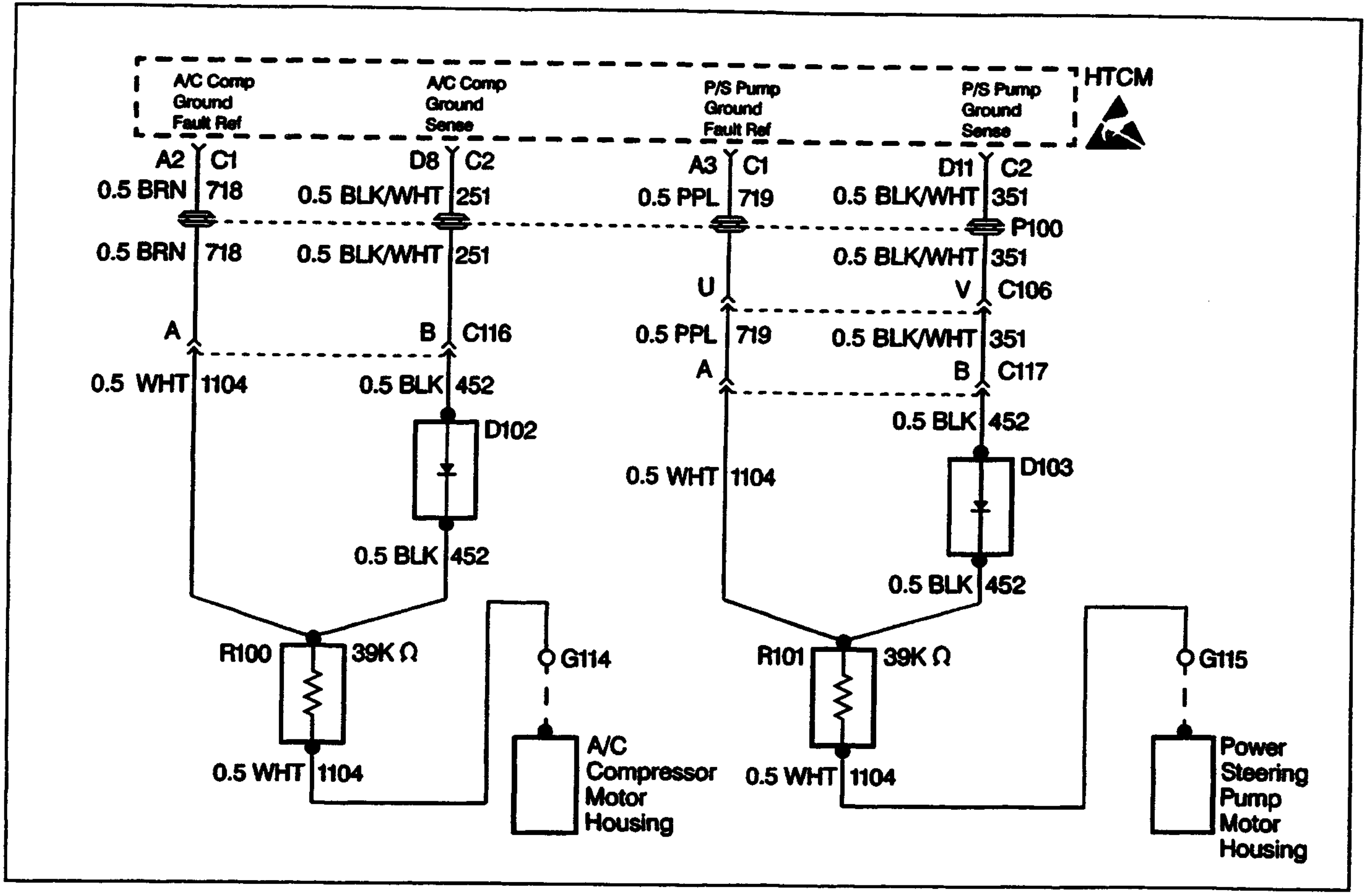
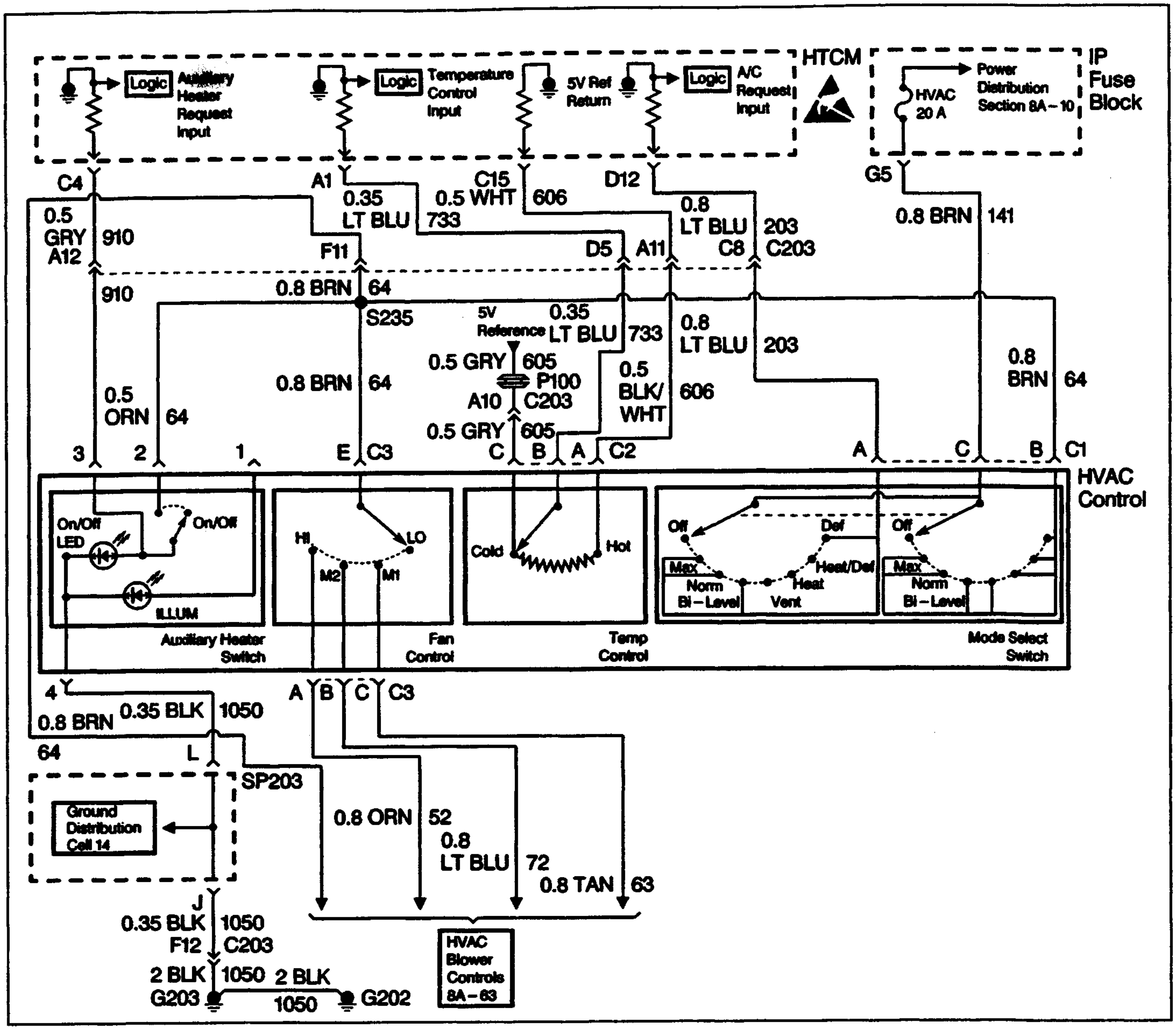
DTC 026 Compressor System Malfunction

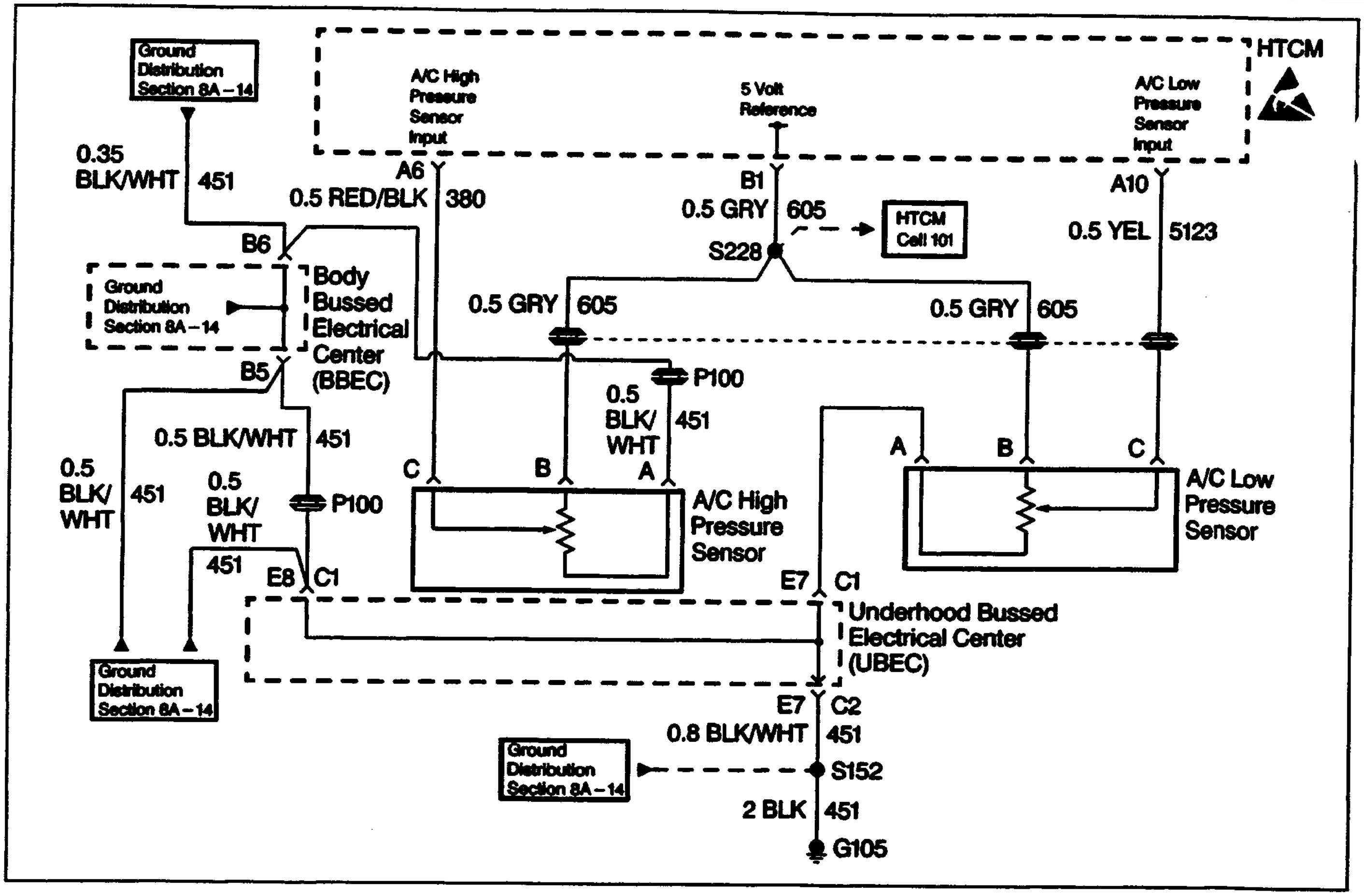

Hot In RUN And START
Hot At All Times
Hot In START, RUN, And OFF
GAUGES Fuse 4 10 A
Power Distribution Section 8A-10
HTCM/VRM Fuse 14 10 A
CLSTR Fuse 11 10 A
IP Fuse Block
J7
0.5 PNK 39
Instrument Cluster Section 8A-81
0.5 PNK 39
J1
E3
0.5 ORN 1740
B8
L5
0.8 PNK 1020
Fuse Block Details Section 8A-11
0.35 PNK 1020
K4 C203
0.35 PNK 39
S218
Fuse Block Details Section 8A-10
S217 0.5 ORN 1740
A
Body Control Interface Module
0.35 PNK 1020
S238
Fuse Block Details Section 8A-11
Fuse Block Details Section 8A-11
0.35 PNK 39
D4
0.5 ORN 1740
C14 C2
0.5 ORN 1740
B2
B3 B4 B5
0.35 PNK 1020
B6 C1
HTCM
Auxiliary Heater Service Request
Run 1
12V Regulated
12V Regulated
Not Used
Ignition Run 0
System Ground
C10 C2
0.8 PNK 39
0.5 PNK 904
D16 C2
0.8 BLK/WHT 451
B7
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
Data Link Connector Section 8A-50
0.5 BLK/WHT 451
B5
0.5 BLK/WHT 451
P100
E8 C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A-14
P100
B A
Auxiliary Heater Service Port
E2 C2
Ground Distribution Section 8A-14
0.8 BLK/WHT 451
S152
2 BLK 451
G105


HTCM
CMC Status 0
CMC Speed
CMC Status 1
CMC Status 2
CMC Current (PWM)
C2
C3
C5
C7
C9
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
P100
B C106
H
J
K
L C105
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
18
4
19
20
8
CMC 47V Status Bit 0
CMC Speed Command
CMC 47V Status Bit 1
CMC 47V Status Bit 2
CMC DC Current


HTCM
A/C Condensor Fan Motor Command
Logic
Hot At All Times
ATC 20 A
Underhood Bussed Electrical Center (UBEC)
0.5 DK GRN 335
C9
1 ORN 1640
APS Output Command
N
F C105
0.5 ORN 5620
0.5 DK GRN 335
0.8 ORN 1640
0.8 BLK 250
D
C
B
A
Solid State
A/C Condensor Fan Motor Buffer
S107
2 BLK 250
M
A/C Condensor Fan Motor


HTCM
A/C Comp Ground Fault Ref
A/C Comp Ground Sense
P/S Pump Ground Fault Ref
P/S Pump Ground Sense
A2
C1
D8
C2
A3
C1
D11
C2
0.5 BRN
718
0.5 BLK/WHT
251
0.5 PPL
719
0.5 BLK/WHT
351
P100
0.5 BRN
718
0.5 BLK/WHT
251
0.5 BLK/WHT
351
U
V
C106
A
B
C116
0.5 PPL
719
0.5 BLK/WHT
351
A
B
C117
0.5 WHT
1104
0.5 BLK
452
D102
0.5 BLK
452
0.5 WHT
1104
D103
0.5 BLK
452
0.5 BLK
452
R100
39K Ω
G114
R101
39K Ω
G115
0.5 WHT
1104
A/C Compressor Motor Housing
0.5 WHT
1104
Power Steering Pump Motor Housing


Logic
Auxiliary Heater Request Input
Logic
Temperature Control Input
5V Ref Return
Logic
A/C Request Input
HTCM
Power Distribution Section 8A-10
HVAC 20 A
IP Fuse Block
C4
A1
0.35 LT BLU
C15
0.5 WHT
606
733
D12
0.8 LT BLU
203
C8
C203
G5
0.8 BRN
141
0.5 GRY
910
A12
F11
D5
A11
910
0.8 BRN
64
S235
5V Reference
0.35 LT BLU
733
0.8 LT BLU
203
0.5 GRY
605
P100
A10
C203
0.5 BLK/WHT
606
0.8 BRN
64
0.5 ORN
64
0.8 BRN
64
0.5 GRY
605
3
2
1
E
C3
C
B
A
C2
A
C
B
C1
HVAC Control
On/Off LED
On/Off
ILLUM
Auxiliary Heater Switch
HI
LO
M2
M1
Fan Control
Cold
Hot
Temp Control
Off
Def
Max
Heat/Def
Norm
Heat
Bi-Level
Vent
Off
Max
Norm
Bi-Level
Mode Select Switch
4
0.8 BRN
0.35 BLK
1050
64
L
A
B
C
C3
SP203
Ground Distribution Cell 14
0.8 ORN
52
0.8 LT BLU
72
0.8 TAN
63
J
0.35 BLK
1050
F12
C203
2 BLK
1050
2 BLK
G203
1050
G202
HVAC Blower Controls 8A-63


Ground Distribution Section 8A-14
A/C High Pressure Sensor Input
5 Volt Reference
A/C Low Pressure Sensor Input
HTCM
0.35 BLK/WHT 451
A6
0.5 RED/BLK 380
B1
0.5 GRY 605
HTCM Cell 101
A10
0.5 YEL 5123
S228
B6
Ground Distribution Section 8A-14
Body Bussed Electrical Center (BBEC)
0.5 GRY 605
0.5 GRY 605
B5
P100
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT
P100
C
B
A
A
B
C
A/C High Pressure Sensor
A/C Low Pressure Sensor
451
E8
C1
E7
C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A-14
E7
C2
0.8 BLK/WHT 451
Ground Distribution Section 8A-14
S152
2 BLK 451
G105

DTC 026 Compressor System Malfunction

The compressor motor (heat pump) is powered by varying A/C voltage. The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors several conditions relating to the A/C compressor. In the event that any of the monitored conditions occurs, but not long enough to set the code assigned to that condition, this code will set. This code is meant to be a red flag that a condition is appearing that may cause compressor system malfunction.

DTC Parameters

DTC 026 will set if:

- CKT 718 (BRN) wire opens or shorts to voltage.
- CKT 719 (PPL) wire opens or shorts to voltage.
- CKT 380 (RED/BLK) wire shorts to voltage.
- CKT 5643 (DK BLU) wire opens or shorts to ground.
- CKT 4905 (PNK/BLK) wire shorts to ground.
- CKT 335 (DK GRN) wire opens.
- CKT 1740 (ORN) wire opens.
- CKT 606 (WHT) wire opens.

DTC 26 will set when:
Anytime the HTCM is awake.

Failure Action

This DTC will be logged, the compressor will be disabled, and the SERVICE SOON telltale will be turned ON.

Related DTCs

HTCM DTCs 10, 25, 32, 33, 40, 61

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

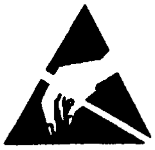
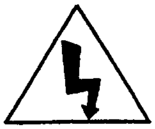
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 026 Compressor System Malfunction Schematic Reference Table

Reference on Schematic	Location
None	

DTC 026 Compressor System Malfunction Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

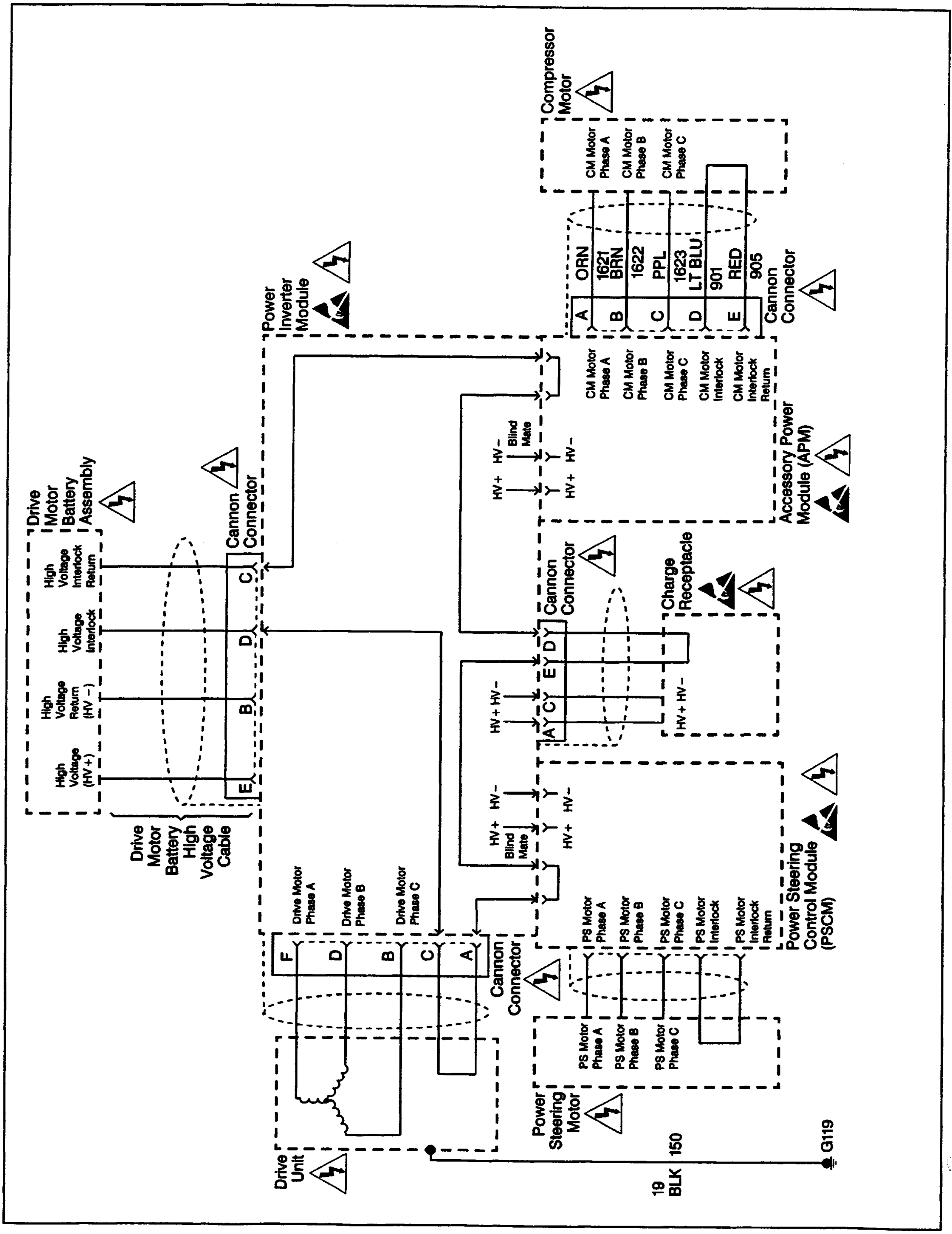
DTC 026 Compressor System Malfunction Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 2	Problem is intermittent. Refer to Diagnostic Aids
2	Are any other codes present with DTC 026.	—	Diagnose other DTCs first.	Go to Step 3
3	Connect a digital multimeter between the positive and negative terminals at the auxiliary battery. Is the voltage greater than the specified value?	13.0 volts	Go to Step 7	Go to Step 4
4	Connect a digital multimeter between the positive and negative terminals at the rear of the accessory power module (APM) Is the voltage greater than the specified value?	13.0 volts	Go to Step 5	Go to Step 6
5	Locate and repair open cable between APM and auxiliary battery. Did you complete the wire repair?	—	Go to Step 12	—
6	Replace auxiliary power module. Did you complete the repair?	—	Go to Step 12	—
7	Refer to DTC Parameters and check for intermittent problems as listed. Did you find an intermittent problem with any of the circuits listed?	—	Go to Step 8	Go to Step 9

Step	Action	Value(s)	Yes	No
8	Repair intermittent problem with suspect circuit. Did you complete the wire repair?	—	Go to Step 12	
9	Check all connections. Refer to *Diagnostic Aids* Did you find a loose, or damaged connection?	—	Go to Step 10	Go to Step 11
10	Repair loose or damaged connection. Is the action complete?	—	Go to Step 12	—
11	Replace HTCM. /APCM. Is the action complete?	—	Go to Step 12	—
12	Replaced all removed components or connectors. Clear DTC(s).	—	System OK	

BLANK

DTC 029 Compressor Motor Overcurrent 1


Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
ORN
1621 BRN
1622 PPL
1623 LT BLU
901 RED
905
A
B
C
D
E
Cannon Connector
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+
HV−
Blind Mate
HV+
HV−
Accessory Power Module (APM)
Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV −)
High Voltage (HV+)
Cannon Connector
C
D
B
E
Drive Motor Battery High Voltage Cable
Cannon Connector
D
E
C
A
HV+ HV−
Charge Receptacle
HV+ HV−
HV+ HV−
HV+
HV−
HV+
Blind Mate
HV+
HV−
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Power Steering Control Module (PSCM)
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19 BLK
150
G119

DTC 029 Compressor Motor Overcurrent 1

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The heat pump ventilation system (HPVS)/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once very second to allow 47 volt and CMC fault detection at the same time. If the CMC detects an over current or over temperature failure, this fault will be reported.

DTC Parameters

DTC29 will set if:

- Open circuit on any of the three compressor motor phases. Short between any of the three compressor motor phases and ground.
- Motor phase to interlock short.
- Short between any of the three compressor motor phase and another phase.
- Seized compressor.
- Restriction in A/C System.
- Auxiliary power module (IGBT failure).

DTC 29 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects an overcurrent or IGBT overtemp condition, the HTCM will be informed (via the discrete digital interface lines). The HTCM will attempt to reset the CMC three times. If the CMC resumes operation, this fault will be set. The third failure will result in an HTCM 030 being set.

Failure Action

This DTC will be logged, and the heat pump will be disabled while the fault is present.

Related DTCs

HTCM 25, 30.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 029 Compressor Motor Overcurrent 1 Schematic Reference Table

Reference on Schematic	Location
None	

DTC 029 Compressor Motor Overcurrent 1 Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 029 Compressor Motor Overcurrent 1 Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must no be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and History HTCM DTC(s). Is HTCM DTC 25 present?	—	Go to HTCM DTC 25	Go to Step 2
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Did DTC reset?	—	Go to Step 3	Condition is intermittent. Refer to Diagnostic Aids
3	1. **CAUTION: REFER TO HIGH VOLTAGE DISABLE IN THIS MANUAL AND DISABLE HIGH VOLTAGE. VEHICLE OFF. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DMM TO OHMS AND CONNECT DMM TO TESTER** 2. Apply A/C voltage to Compressor Motor. Is the resistance less than the specified value?	5.0 M Ω	Go to Step 4	Go to Step 5
4	Replace compressor motor. Is the action complete?	—	Go to Step 7	—
5	Check the resistance across the compressor motor windings at each switch setting on the tool. Is the resistance across each winding between specification?	0.8 and 2.0 Ω	Go to Step 6	Go to Step 4
6	Replace APM. Refer to Section 6A. Is the action complete? **NOTICE:** Perform A/C system performance test in Section 1B.	—	Go to Step 7	—
7	Install removed components and connectors. Clear DTC(s).	—	System OK	—

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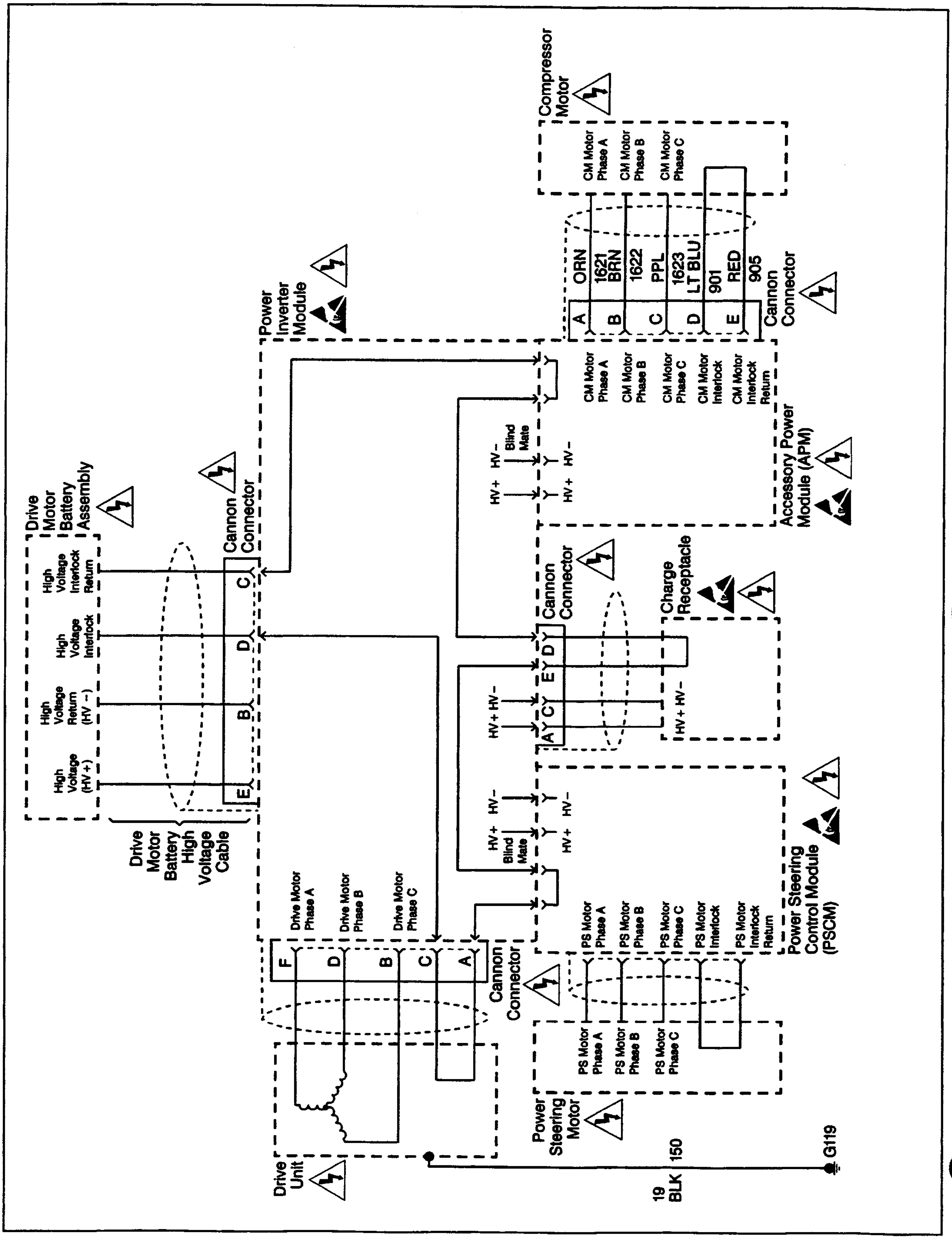
DTC 030 Compressor Motor Overcurrent 2


Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
A ORN
B 1621 BRN
C 1622 PPL
D 1623 LT BLU
E 901 RED
905
Cannon Connector
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+ HV–
Blind Mate
HV+ HV–
Accessory Power Module (APM)
Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV –)
High Voltage (HV+)
C D B E
Cannon Connector
Drive Motor Battery High Voltage Cable
Cannon Connector
D E C A
Charge Receptacle
HV+ HV–
HV+ HV–
HV+ HV–
Blind Mate
HV+ HV–
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F D B C A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Power Steering Control Module (PSCM)
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19 BLK 150
G119

DTC 030 Compressor Motor Overcurrent 2

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The heat pump ventilation system (HPVS)/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicated status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line two high and low once every second to allow 47 volt and CMC fault detection at the same time. If the CMC detects an over current or over temperature failure, this fault will be reported.

DTC Parameters

DTC30 will set if:

- Open circuit on any of the three compressor motor phases.
- Short between any of the three compressor motor phases and gourd.
- Short between any of the three compressor motor phase and another phase.
- Auxiliary power module (APM) fault.

DTC 30 will set when:

Anytime the HTCM is awake and heat pump is running.

If the CMC detects an overcurrent or an APM isolated gate bi-polar transistor (IGBT) overtemp condition, the HTCM will be informed (via the discrete digital interface lines. The HTCM will attempt to reset the CMC three times. If the CMC resumes normal operation, an HTCM DTC 29 will be set. The third failure will result in an HTCM DTC 30 being set.

Failure Action

This DTC will be logged, and the heat pump will be disabled until power is cycled OFF and ON.

Related DTCs

HTCM 29.

Telltale Illuminated

None

Other Controller Interfaces

None

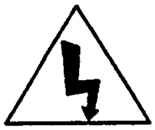
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 030 Compressor Motor Overcurrent 2 Schematic Reference Table

Reference on Schematic	Location
None	

DTC 030 Compressor Motor Overcurrent 2 Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 030 Compressor Motor Overcurrent 2 Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). Is HTCM DTC 25 set?	—	Diagnose HTCM DTC 25 first.	Go to Step 2
2	1. Clear HTCM DTC's 2. Cycle ignition switch off and then to the RUN position. 3. Turn A/C on and wait 30 seconds. Did HTCM DTC 30 reset?	—	Go to Step 3	Diagnose HTCM DTC 29.
3	1. **CAUTION: REFER TO HIGH VOLTAGE DISABLE IN THIS MANUAL AND DISABLE HIGH VOLTAGE. VEHICLE OFF. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DMM TO OHMS AND CONNECT DMM TO TESTER** 2. Apply A/C voltage to Compressor Motor. Is the resistance less than the specified value?	5.0 M Ω	Go to Step 4	Go to Step 5
4	Replace compressor motor. Is the action complete?	—	Go to Step 7	—
5	Check the resistance across the compressor motor windings at each switch setting on the tool. Is the resistance across each winding between specification?	0.8 and 2.0 Ω	Go to Step 6	Go to Step 4
6	Replace APM. Refer to Section 6A. Is the action complete? **NOTICE:** Perform A/C system performance test in Section 1B.	—	Go to Step 7	—
7	Install removed components and connectors. Clear DTC(s).	—	System OK	—

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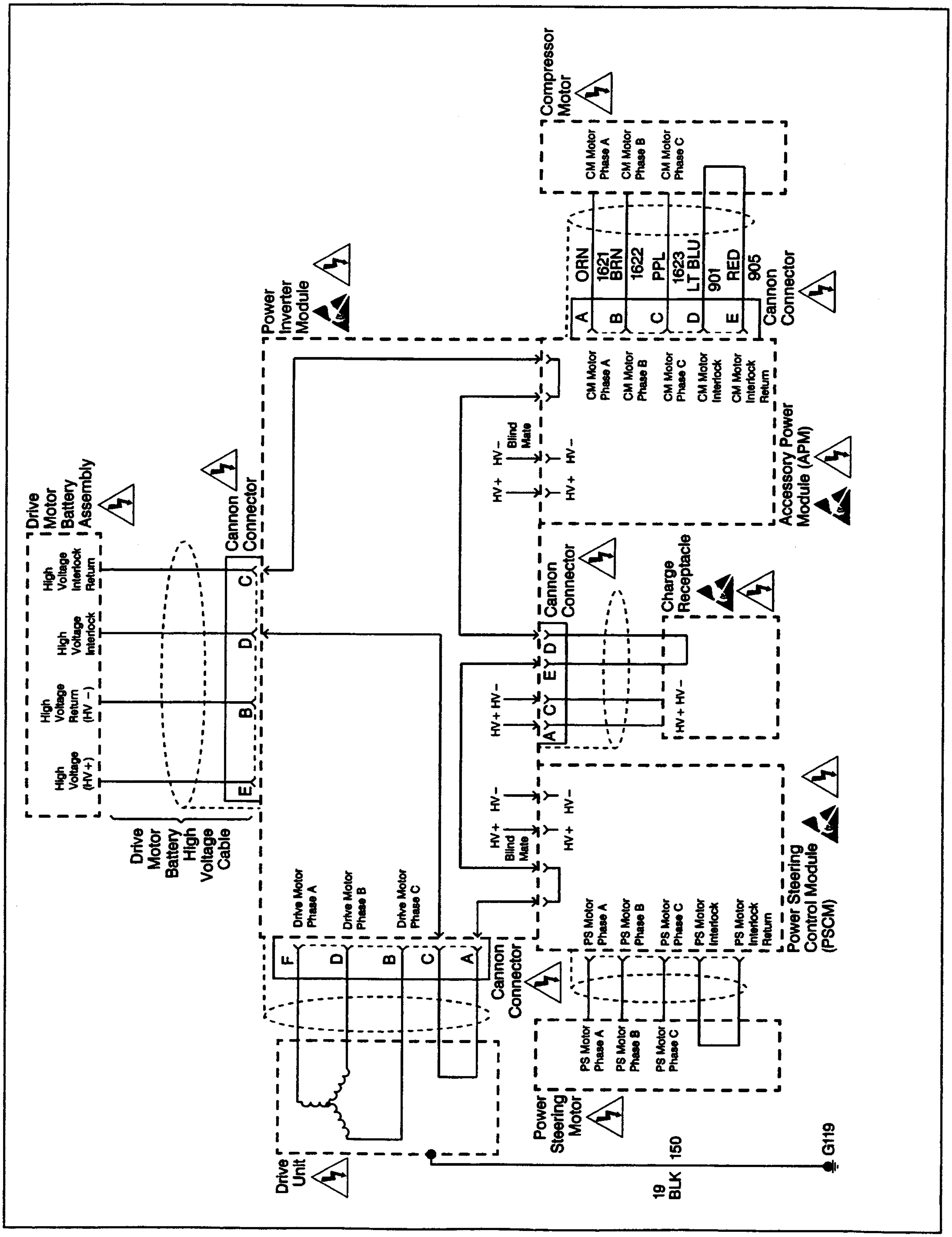
DTC 031 Compressor Motor Voltage Out Of Range


Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
ORN
1621 BRN
1622 PPL
1623 LT BLU
901 RED
905
A
B
C
D
E
Cannon Connector
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
Accessory Power Module (APM)
HV+
HV−
Blind Mate
HV+
HV−
Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV −)
High Voltage (HV+)
Cannon Connector
C
D
B
E
Drive Motor Battery High Voltage Cable
Cannon Connector
D
E
C
A
HV+ HV−
Charge Receptacle
HV+ HV−
HV+
HV−
Blind Mate
HV+
HV−
Power Steering Control Module (PSCM)
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19 BLK
150
G119

DTC 031 Compressor Motor Voltage Out Of Range

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The heat pump ventilation system (HPVS)/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second to allow 47 volt and CMC fault detection at the same time. If the CMC detect the input voltage out of range, this fault will be reported.

DTC Parameters

DTC31 will set if:

- Battery pack low state of charge.
- Battery pack voltage too high (this could occur during regen).

DTC 31 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects input voltage above 430 volts or below 215 volts, this fault will set. This fault should never be set without a related BPM DTC being set.

Failure Action

This DTC will be logged, the SERVICE SOON telltale will be turned ON, and the heat pump will be disabled.

Related DTCs

BPM 221, 222.

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 031 Compressor Motor Voltage Out Of Range Schematic Reference Table

Reference on Schematic	Location
None	

DTC 031 Compressor Motor Voltage Out Of Range Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 031 Compressor Motor Voltage Out Of Range Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). Are any other DTC(s) set?	—	Go to Appropriate DTC(s)	Go to Step 2
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Did DTC reset?	—	Go to Step 3	Condition is intermittent. Refer to Diagnostic Aids
3	**CAUTION: REFER TO PEB REMOVAL PROCEDURE IN PROPULSION SERVICE MANUAL. REMOVE PEB. MEASURE RESISTANCE BETWEEN APM TO PIM CONNECTOR PIN A2 AND PIM TO BATTERY CONNECTOR PIN B. MEASURE RESISTANCE BETWEEN APM TO PIM CONNECTOR PIN A1 AND PIM TO BATTERY CONNECTOR PINb** Are both resistance readings below specification?	1.0 Ω	Go to Step 4	Go to Step 5
4	Replace APM. Refer to Section 6A. Is the action complete?	—	Go to Step 6	—
5	Replace PIM. Refer to Section 6A. Is the action complete?	—	Go to Step 6	—
6	Install removed components and connectors. Clear DTC(s).	—	System OK	—

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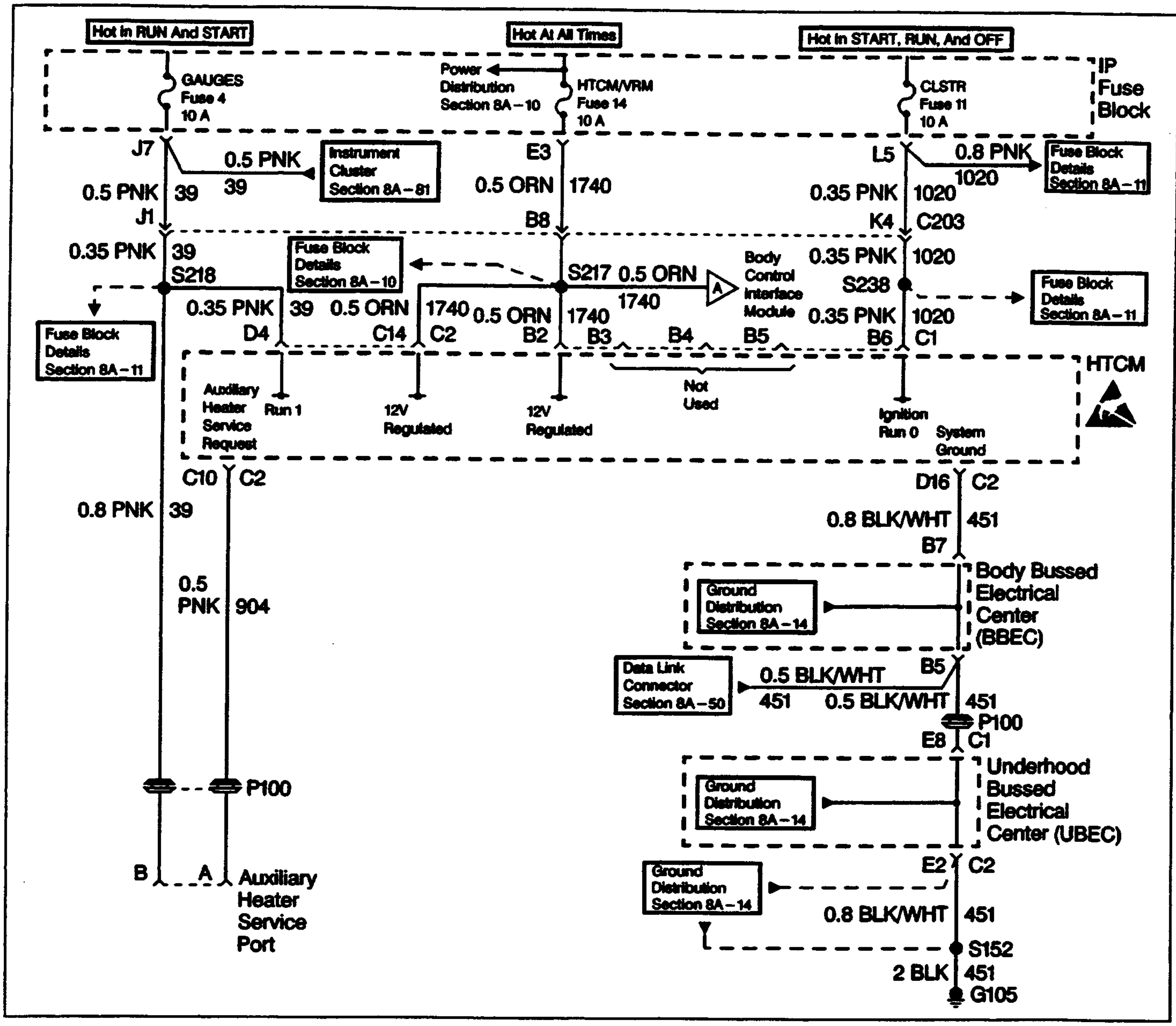
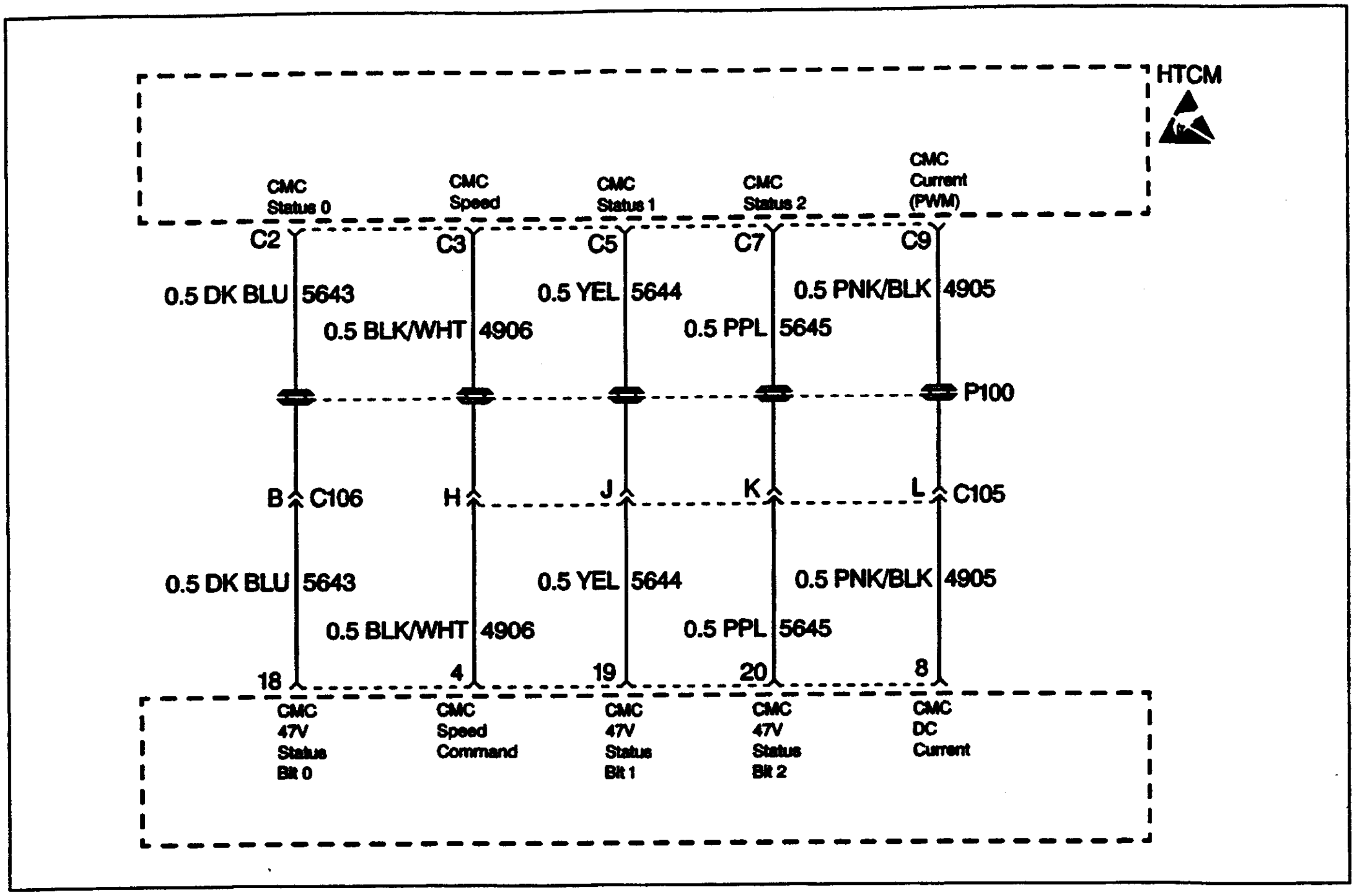
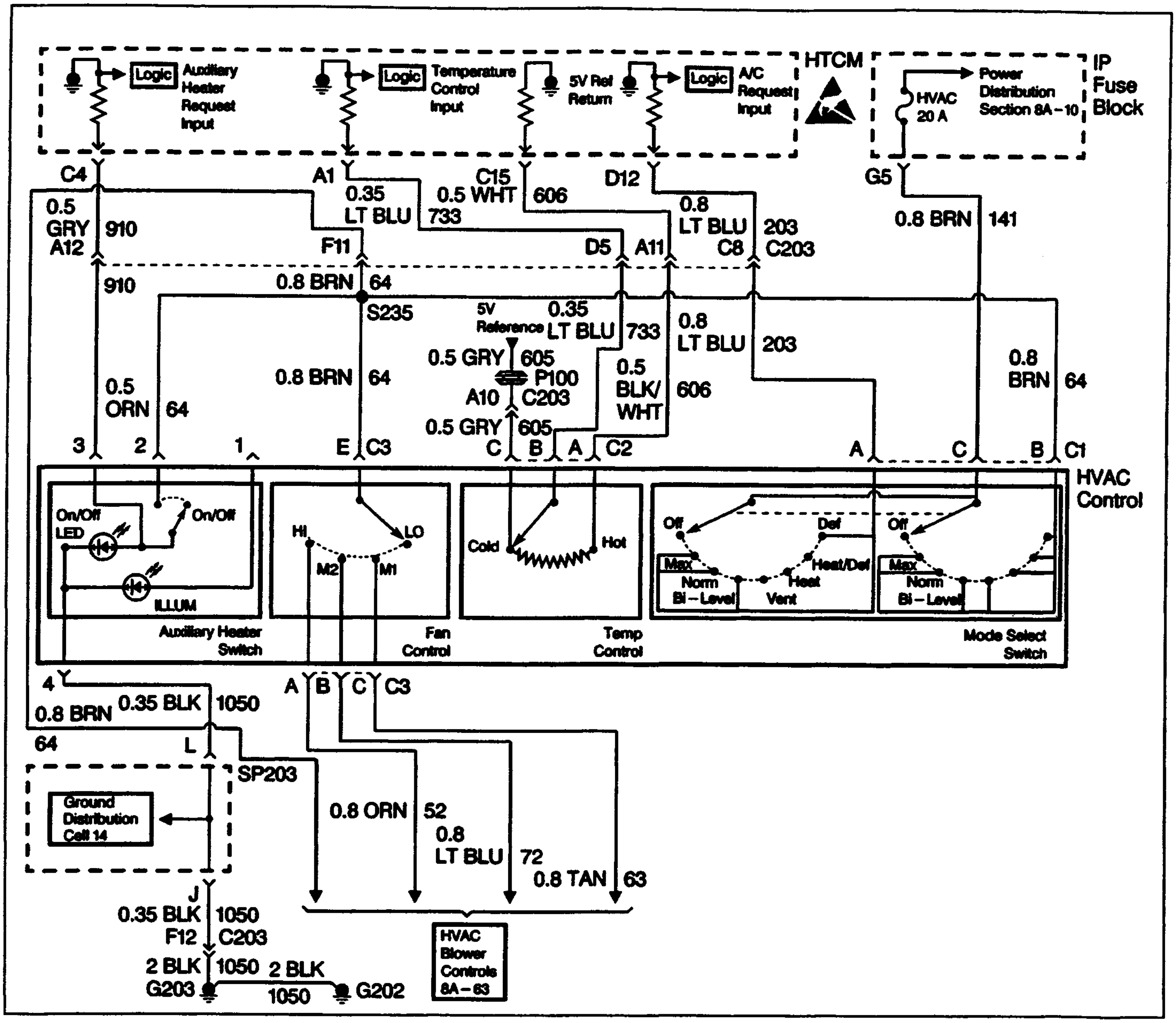
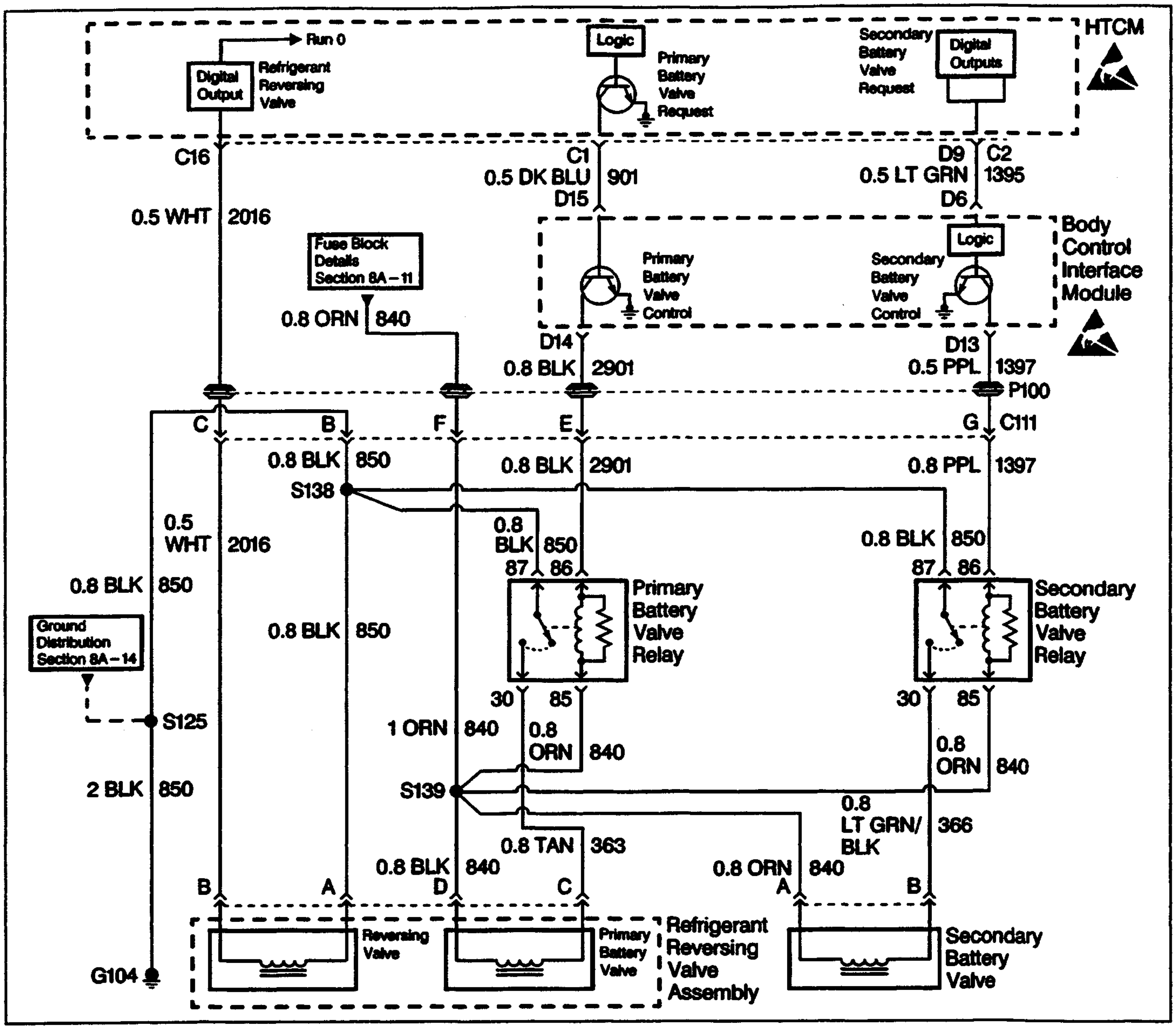
DTC 032 Compressor Motor (CM) Over Temperature Or Interlock


Hot in RUN And START
Hot At All Times
Hot in START, RUN, And OFF
IP Fuse Block
GAUGES Fuse 4 10 A
Power Distribution Section 8A-10
HTCM/VRM Fuse 14 10 A
CLSTR Fuse 11 10 A
J7
0.5 PNK
39
Instrument Cluster Section 8A-81
0.5 PNK
39
J1
E3
0.5 ORN
1740
B8
L5
0.8 PNK
1020
Fuse Block Details Section 8A-11
0.35 PNK
1020
K4
C203
0.35 PNK
39
S218
Fuse Block Details Section 8A-10
S217
0.5 ORN
1740
A
Body Control Interface Module
0.35 PNK
1020
S238
Fuse Block Details Section 8A-11
Fuse Block Details Section 8A-11
0.35 PNK
39
0.5 ORN
1740
0.5 ORN
1740
0.35 PNK
1020
D4
C14
C2
B2
B3
B4
B5
B6
C1
HTCM
Auxiliary Heater Service Request
Run 1
12V Regulated
12V Regulated
Not Used
Ignition Run 0
System Ground
C10
C2
D16
C2
0.8 PNK
39
0.8 BLK/WHT
451
B7
0.5 PNK
904
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
Data Link Connector Section 8A-50
0.5 BLK/WHT
451
B5
0.5 BLK/WHT
451
P100
E8
C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A-14
P100
E2
C2
Ground Distribution Section 8A-14
0.8 BLK/WHT
451
S152
2 BLK
451
G105
B
A
Auxiliary Heater Service Port


HTCM
CMC Status 0
CMC Speed
CMC Status 1
CMC Status 2
CMC Current (PWM)
C2
C3
C5
C7
C9
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
P100
B
C106
H
J
K
L
C105
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
18
4
19
20
8
CMC 47V Status Bit 0
CMC Speed Command
CMC 47V Status Bit 1
CMC 47V Status Bit 2
CMC DC Current


Logic
Auxiliary Heater Request Input
Logic
Temperature Control Input
5V Ref Return
Logic
A/C Request Input
HTCM
HVAC 20 A
Power Distribution Section 8A-10
IP Fuse Block
C4
0.5 GRY 910
A12
A1
0.35 LT BLU 733
F11
C15
0.5 WHT 606
D12
0.8 LT BLU 203
C8 C203
D5
A11
G5
0.8 BRN 141
910
0.8 BRN 64
S235
5V Reference
0.35 LT BLU 733
0.8 LT BLU 203
0.5 GRY 605
P100
A10 C203
0.5 GRY 605
0.8 BRN 64
0.5 BLK/WHT 606
0.5 ORN 64
0.8 BRN 64
3
2
1
E C3
C
B
A C2
A
C
B C1
HVAC Control
On/Off LED
On/Off
ILLUM
Auxiliary Heater Switch
HI
LO
M2
M1
Fan Control
Cold
Hot
Temp Control
Off
Def
Max
Norm
Bi-Level
Heat/Def
Heat
Vent
Off
Max
Norm
Bi-Level
Mode Select Switch
4
0.8 BRN
0.35 BLK 1050
64
L
A
B
C C3
SP203
Ground Distribution Cell 14
0.8 ORN 52
0.8 LT BLU 72
0.8 TAN 63
HVAC Blower Controls 8A-63
J
0.35 BLK 1050
F12 C203
2 BLK 1050
G203
2 BLK 1050
G202


HTCM
Run 0
Digital Output
Refrigerant Reversing Valve
Logic
Primary Battery Valve Request
Secondary Battery Valve Request
Digital Outputs
C16
C1
0.5 DK BLU 901
D15
D9 C2
0.5 LT GRN 1395
D6
0.5 WHT 2016
Fuse Block Details Section 8A-11
0.8 ORN 840
Body Control Interface Module
Logic
Primary Battery Valve Control
Secondary Battery Valve Control
D14
0.8 BLK 2901
D13
0.5 PPL 1397
P100
C B F E G C111
0.8 BLK 850
S138
0.8 BLK 2901
0.8 PPL 1397
0.5 WHT 2016
0.8 BLK 850
87 86
Primary Battery Valve Relay
0.8 BLK 850
87 86
Secondary Battery Valve Relay
0.8 BLK 850
Ground Distribution Section 8A-14
0.8 BLK 850
S125
30 85
1 ORN 840
0.8 ORN 840
30 85
0.8 ORN 840
2 BLK 850
S139
0.8 LT GRN/BLK 366
0.8 TAN 363
0.8 BLK 840
0.8 ORN 840
B A D C A B
Reversing Valve
Primary Battery Valve
Refrigerant Reversing Valve Assembly
Secondary Battery Valve
G104

DTC 032 Compressor Motor (CM) Over Temperature Or Interlock

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs. The heat pump ventilation system (HPVS)/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data. APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The CMC includes an interlock circuit and an over - temperature switch. If the compressor temperature exceeds TBD, the over - temperature switch will open. If this occurs, or if any portion of the interlock circuit opens, the accessory power module (APM) will report that the interlock is open, and the compressor will be shut down.

DTC Parameters

DTC32 will set if:

- Open compressor circuit.
- Compressor over-temperature.

DTC 32 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC detects an open interlock circuit, this fault will set.

Failure Action

The DTC will be logged, and the heat pump will be disabled.

Related DTCs

None

Telltale Illuminated

None

Other Controller Interfaces

None

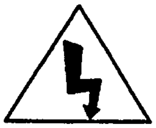
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets. Try running compressor for some time to duplicate DTC.

DTC 032 Compressor Motor (CM) Over Temperature Or Interlock Schematic Reference Table

Reference on Schematic	Location
None	

DTC 032 Compressor Motor (CM) Over Temperature Or Interlock Schematic Icon Table

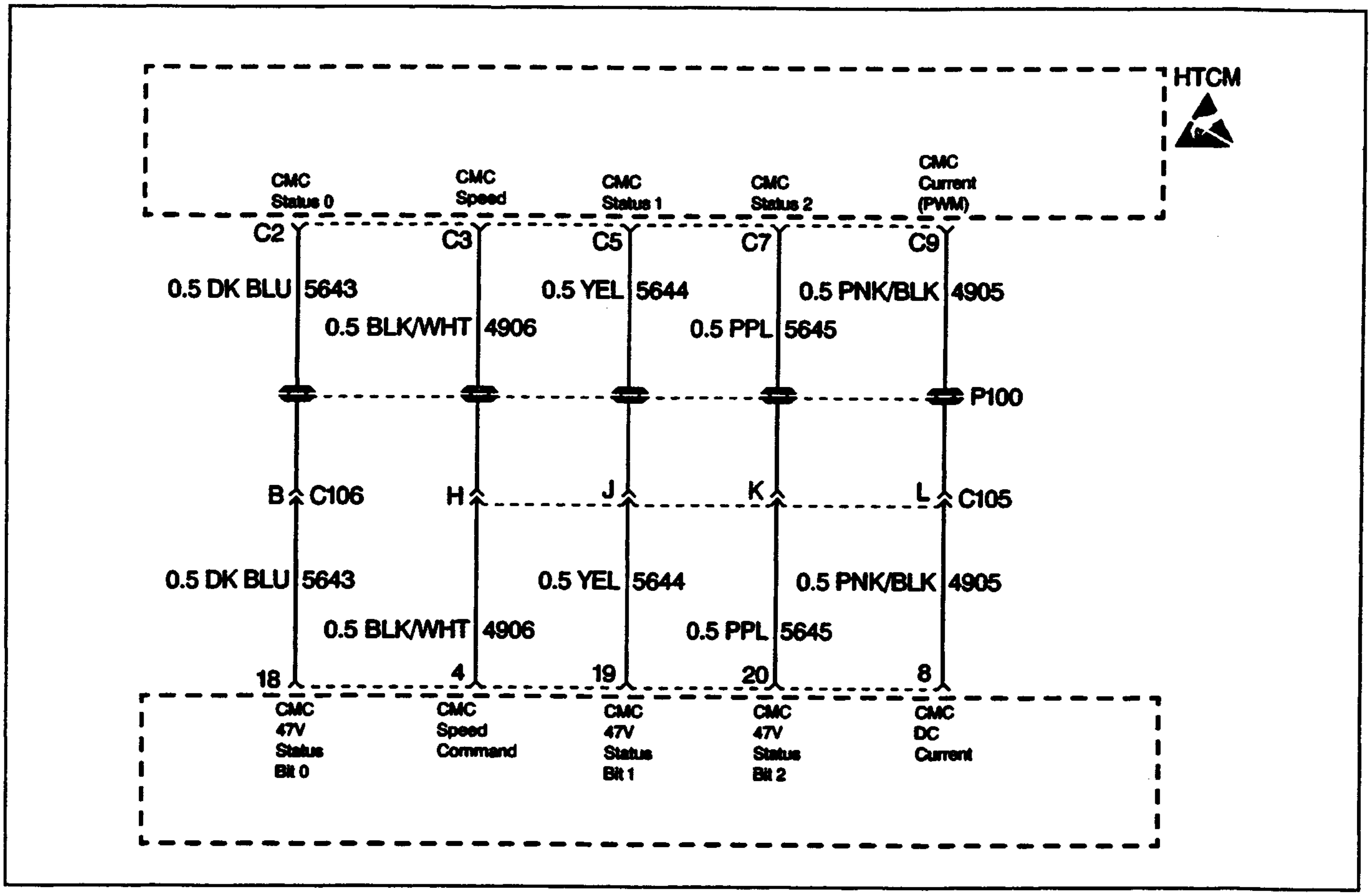
Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

DTC 032 Compressor Motor (CM) Over Temperature Or Interlock Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Cycle compressor ON and OFF. Did DTC reset?	—	Go to Step 2	Condition is intermittent. Refer to Diagnostic Aids
2	**CAUTION: REFER TO HIGH VOLTAGE DISABLE IN THIS MANUAL AND DISABLE THE HIGH VOLTAGE. CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR JUMPER. MAKE SURE 15 MINUTES HAS PASSED SINCE LAST COMPRESSOR CYCLE. MEASURE RESISTANCE ON THE INTERLOCK LOOP.** Is the resistance less than specification?	1.5 Ω	Go to Step 3	Go to Step 6
3	Check resistance of each phase. Is resistance between specifications?	0.8 and 2.0 Ω	Go to Step 4	Go to Step 6

Step	Action	Value(s)	Yes	No
4	Run through system Performance Test in Section 1B. Is system OK based on this test.	—	Go to Step 5	Go to Step 7
5	Replace APM. Refer to Section 6A Is the action complete?	—	Go to Step 8	—
6	Replace compressor motor. Refer to Section 1B. Is the action complete?	—	Go to Step 8	—
7	Perform repairs as stated by the System Performance Test.	—	Go to Step 8	—
8	Install removed components and connectors. Clear DTC(s)	—	System OK	—

DTC 033 Compressor Motor (CM) Current Out Of Range


HTCM
CMC Status 0
CMC Speed
CMC Status 1
CMC Status 2
CMC Current (PWM)
C2
C3
C5
C7
C9
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
P100
B C106
H
J
K
L C105
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
18
4
19
20
8
CMC 47V Status Bit 0
CMC Speed Command
CMC 47V Status Bit 1
CMC 47V Status Bit 2
CMC DC Current

DTC 033 Compressor Motor (CM) Current Out Of Range

The accessory power module (APM) provides compressor motor controller (CMC) feedback current to the heat pump ventilation system (HPVS)/thermal control module (HTCM) via a 12 volt pulse width modulated (PWM) signal. This signal represents the amperage of high voltage current that the compressor is drawing. If the circuit becomes open or shorted, this fault will be reported.

DTC Parameters

DTC33 will set if:

- PWM circuit open or short to ground or voltage.
- APM failure.
- HTCM failure.

DTC 33 will set when:

Anytime the HTCM is awake and heat pump is running. If the CMC feedback signal becomes less than 5% or greater than 95%, this fault will set. This fault will not be set if an HTCM DTC 27(APM shutdown) or 43 (Automatic disconnect open) is active.

Failure Action

This DTC will be logged, and heat pump will be disabled.

Related DTCs

HTCM 27, 43, 65.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 033 Compressor Motor (CM) Current Out Of Range Schematic Reference Table

Reference on Schematic	Location
None	

DTC 033 Compressor Motor (CM) Current Out Of Range Schematic Icon Table

Icon	Icon Definition
⚠	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.
⚡	This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.*

DTC 033 Compressor Motor (CM) Current Out Of Range Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition On. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). Are other DTC's present (except HTCM DTC 026)?	—	Diagnose other DTC's first.	Go to Step 2
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Did DTC reset?	—	Go to Step 3	Condition is intermittent. Refer to Diagnostic Aids
3	1. Backprobe using a digital multimeter between CKT 4905 (PNK/BLK) wire cavity C9 at HTCM and ground. 2. Turn ignition to the RUN position. 3. Select duty cycle on the digital multimeter. Is the reading within the specified value?	5%-95% Duty Cycle	Go to Step 9	Go to Step 4
4	1. Disconnect HTCM C2 connector 2. Connect a digital multimeter between CKT 4905 (PNK/BLK) wire cavity C9 and ground. Is the voltage within 10 % of the specified value?	Battery voltage	Go to Step 9	Go to Step 5
5	1. Disconnect APM 2. With the digital multimeter still connected between CKT 4905 (PNK/BLK) wire at the HTCM and ground, check the resistance. Is the resistance less than the specified value?	5.0 Ω	Go to Step 6	Go to Step 7

Step	Action	Value(s)	Yes	No
6	Locate and repair short to ground in CKT 4905 (PNK/BLK) wire. Is the action complete?	—	Go to Step 11	—
7	Connect a digital multimeter between CKT 4905 (PNK/BLK) wire cavity C9 at HTCM and CKT 4905 (PNK/BLK) wire cavity 8 at APM Is the resistance less than the specified value?	5.0 Ω	Go to Step 10	Go to Step 8
8	Locate and repair open CKT 4905 (PNK/BLK) wire. Is the action complete?	—	Go to Step 11	—
9	Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 11	—
10	Replace APM. Refer to Section 6A. Is the action complete?	—	Go to Step 11	—
11	Install removed components and connectors. Clear DTC(s)	—	System OK	—

DTC 035 Drive Motor Control Module (DMCM) Serial Data Loss

DTC 035 Drive Motor Control Module (DMCM) Serial Data Loss Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. Connect a scan tool. 3. Read and record current and history HTCM DTC(s). 4. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Are other serial Data DTC(s) set? (PCM 026 or 029 HTCM 34-36)	—	Refer to SECTION 6 for Serial Data Diagnosis	Go to Step 2
2	Clear all DTC(s), cycle vehicle OFF and back ON and check for DTC(s). Did DTC reset?	—	Go to Step 3	See Diagnostic Aids
3	Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 4	—
4	Install removed components and connectors. Clear DTC(s).	—	System OK	—

DTC 036 Battery Pack Control Module (BPCM) Serial Data Loss

DTC 036 Battery Pack Control Module (BPCM) Serial Data Loss

The heat pump ventilation system (HPVS)/thermal control module (HTCM) depends on serial data transmissions from the battery pack module (BPM) that contain pack voltage and auto disconnect status. In addition, the HTCM uses BPM current, charge port cooling request, and periodic wake up information. If serial data communication with the RSA is lost, this fault will be set.

DTC Parameters

DTC36 will set if:

- Serial data circuit open.
- Failed BPM.

DTC 36 will set when:

Anytime the HTCM is awake due to Run 1 input (the vehicle is in run mode) and serial data has not been received from the BPM for 6 seconds, this fault will set.

Failure Action

This DTC will be logged, and the following default values will be used in place of the data normally received from the BPM.

Pack Voltage	None
Pack Voltage Faults	DTC 044 present
Auto Disconnect Status	DTC 043 present
Current Available	No (locks out preconditioning)
Charge Port Cool Request	Wake Up
BPM Periodic Wake Up	No (locks out periodic wake up)

- The HTCM will enter charge mode if the BPM is commanding vehicle wake up.

Related DTCs

All serial data DTCs.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

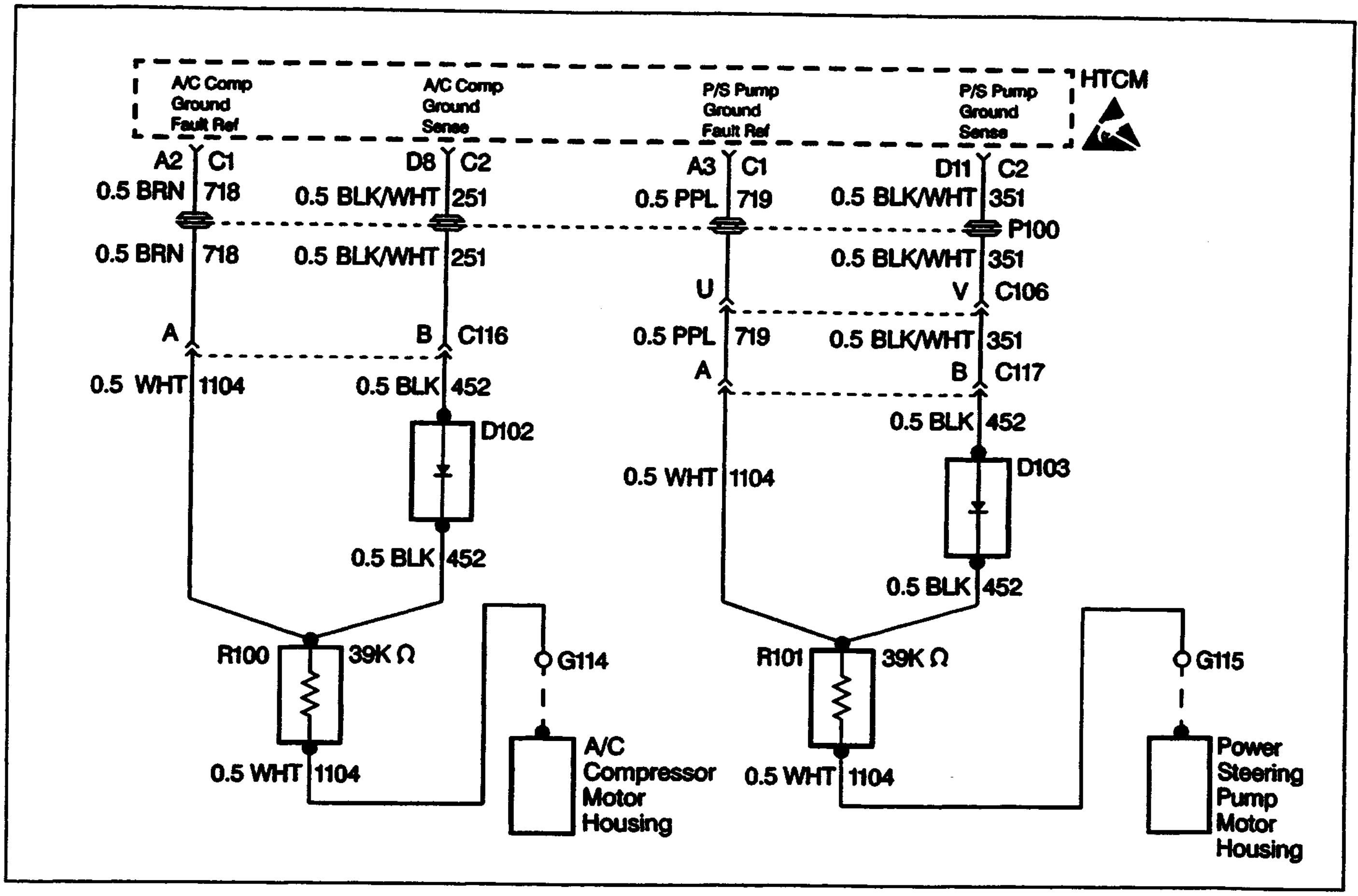
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 036 Battery Pack Control Module (BPCM) Serial Data Loss Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Are other serial data DTC(s) Set? (PCM 026 or 029, BPM 300 or 301, HTCM 34-36)	—	Refer to BPM DTC 273 in the Battery and Charging manual for diagnosis.	Go to Step 2
2	Clear all DTC(s), cycle vehicle OFF and back ON and check for DTC(s). Did DTC reset?	—	Go to Step 3	See Diagnostic Aids
3	Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 4	—
4	Install removed components and connectors. Clear DTC(s).	—	System OK	—

DTC 040 Power Steering Motor Ground Sense Open


HTCM
A/C Comp Ground Fault Ref
A/C Comp Ground Sense
P/S Pump Ground Fault Ref
P/S Pump Ground Sense
A2 C1
D8 C2
A3 C1
D11 C2
0.5 BRN 718
0.5 BLK/WHT 251
0.5 PPL 719
0.5 BLK/WHT 351
P100
U
V
C106
A
B
C116
C117
0.5 WHT 1104
0.5 BLK 452
D102
D103
R100
R101
39K Ω
G114
G115
A/C Compressor Motor Housing
Power Steering Pump Motor Housing

DTC 040 Power Steering Motor Ground Sense Open

The electro-hydraulic power steering (EHPS) motor is powered by varying A/C voltage. The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors the EHPS motor case voltage via the EHPS cases sense circuit. In the event of the loss of both EHPS ground paths or high ground resistance coupled with EHPS motor loss of isolation, the case voltage will rise. When the voltage on the sense line exceeds 1.5 volts DC the HTCM will set this fault and disable the compressor.

DTC Parameters

DTC40 will set if:

- Circuit 719 open.
- Ground Sensing harness assembly fault.
- Total loss of EHPS motor ground.
- Partial Loss of EHPS motor ground, combined with loss of EHPS motor isolation.
- HTCM fault.

DTC 10 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects voltage greater than 1.5 volts DC at the EHPS motor case sense input.

Failure Action

This DTC will be logged, the EHPS motor may be disabled, and the SERVICE SOON telltale will be turned ON.

Related DTCs

None

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

If the problem is not resolved by using the trouble tree, try spraying the power steering pump ground sensing harness, and connectors with salt water, then step through the trouble tree again.

Check the tightness of the female terminal grip with a spare male terminal.

Check continuity of CKT 351 (BLK/WHT) wire between A/C compressor ground shield and HTCM cavity D connector C2.

Check for short to voltage on CKT 719 (BRN) wire.

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 040 Power Steering Motor Ground Sense Open Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 2	Problem is intermittent. Refer to Diagnostic Aids
2	1. **CAUTION: REFER TO HIGH VOLTAGE DISABLE IN THIS MANUAL AND DISABLE HIGH VOLTAGE. VEHICLE OFF, CONNECT POWER STEERING AND A/C COMPRESSOR ELECTRICAL TESTER TO COMPRESSOR PIGTAIL. SET DMM TO OHMS AND CONNECT DMM TO TESTER** 2. Apply A/C voltage to the power steering pump motor . Refer to Insulation Test Procedure in Section 1B. Is the reading less than the specified value?	5.0 M Ω	Go to Step 9	Go to Step 3
3	Connect a digital multimeter between the power steering pump ground shield and the power steering pump body. Is the resistance less than the specified value?	1.0 Ω	Go to Step 4	Go to Step 9
4	1 Place vehicle in park and turn the ignition to the OFF position. 2. Inspect the power steering pump ground cable. Is the ground cable damaged of disconnected?	—	Go to Step 5	Go to Step 6
5	Repair or replace ground cable as necessary.	—	Go to Step 11	—
6	1. Disconnect C117. 2. Turn ignition to the RUN position. 3. Connect a digital multimeter between harness side of C117 pin A and ground. Is the voltage less that the specified value?	4.5 volts	Go to Step 7	Go to Step 8
7	Locate and repair open CKT 719 (PPL) wire. If CKT 719 (PPL) wire is OK, replace HTCM Did you complete the repair?	—	Go to Step 11	—
8	Connect a digital multimeter between CKT 719 (PPL) wire pin A at the power steering pump side of C117 and the power steering pump motor housing. Is the resistance between the specified values?	35K and 45K Ω	Go to Step 9	Go to Step 10
9	Replace power steering pump motor. Is the action complete?	—	Go to Step 11	—
10	Check all connections. If no trouble found, refer to *Diagnostic Aids*	—	Go to Step 11	—
11	Replaced all removed components or connectors. Clear DTC(s).	—	System OK	—

DTC 043 Automatic Disconnect Open

DTC 043 Automatic Disconnect Open

The heat pump ventilation system (HPVS)/thermal control module (HTCM) constantly motors the serial data line to receive information from and about other controllers. If the BPM indicated (via serial data) that the auto disconnect is open, this DTC will be set.

DTC Parameters

DTC43 will set if:

- The automatic disconnect is open.
- DTC 43 will set when:

Anytime the HTCM is awake. This condition exists if the BPM indicates auto disconnect open over serial data.

Failure Action

This DTC will be logged. In addition, the HTCM de-asserts vehicle wake-up and disables both the cabin blower and the rear defogger. Also, fault diagnosis requiring APM inputs are disabled. Finally, the system will default to VENT mode and will remain in VENT mode until selected otherwise by the passenger from the run/lock shift assembly (RSA). The RSA LEDs will change to VENT mode.

Related DTCs

BPM 272 through BPM 280.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

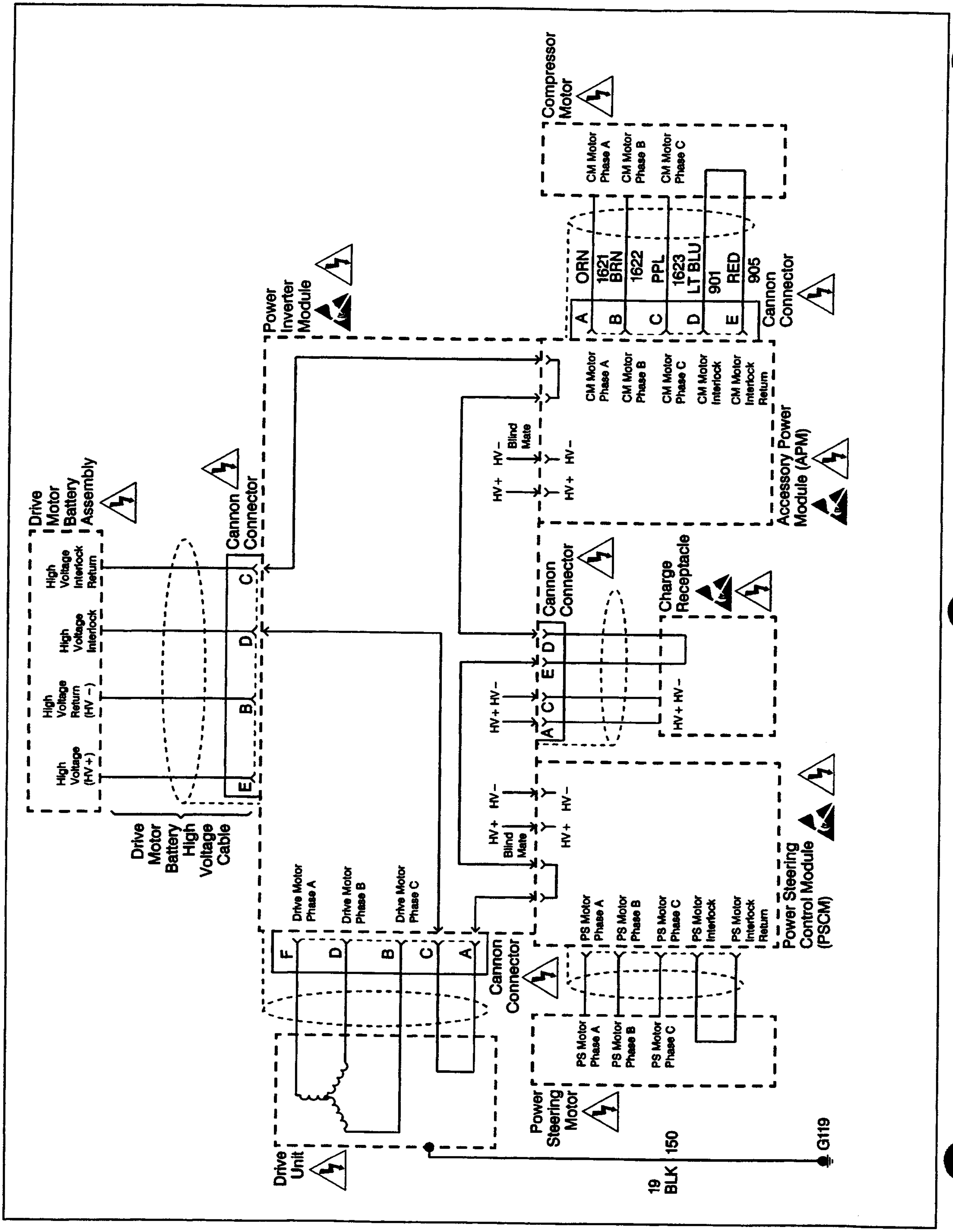
BPM DTCs should always accompany this DTC. If it is current to the BPM DTCs for diagnosis

DTC 043 Automatic Disconnect Open Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Refer to BPM DTC(s) in the Battery Pack Internal Diagnostic service manual for diagnosis.	—	—	—

BLANK

DTC 044 Drive Motor Battery Assembly (DMA) Voltage



Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV –)
High Voltage (HV+)
Drive Motor Battery High Voltage Cable
Cannon Connector
C
D
B
E
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+
HV–
Blind Mate
Accessory Power Module (APM)
Compressor Motor
ORN
1621 BRN
1622 PPL
1623 LT BLU
901 RED
905
A
B
C
D
E
Cannon Connector
Cannon Connector
D
E
C
A
Charge Receptacle
HV+ HV–
HV+
HV–
Blind Mate
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Power Steering Control Module (PSCM)
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
Power Steering Motor
Drive Unit
19 BLK 150
G119

DTC 044 Drive Motor Battery Assembly (DMA) Voltage

The heat pump ventilation system (HPVS)/thermal control module (HTCM) constantly monitors the serial data line to receive information from and about other controllers. If the BPM indicates (via serial data) that there is a pack voltage fault, this DTC will be set.

DTC Parameters

DTC44 will set if:

- Battery pack voltage faults.
- DTC 44 will set when:

Anytime the HTCM is awake. This fault exists if the BPM indicates auto disconnect open over serial data.

Failure Action

This DTC will be logged. In addition, the heat pump is disabled.

Related DTCs

BPM module and pack faults.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

BPM DTCs should always accompany this DTC. Refer to the BPM DTCs for diagnosis.

DTC 044 Drive Motor Battery Assembly (DMA) Voltage Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Refer to BPM DTC(s) in the Battery Pack Internal Diagnostic service manual for diagnosis.	—	—	—

DTC 045 Memory Failure (ROM, EEPROM)

DTC 045 Memory Failure (ROM, EEPROM)

Each time the heat pump ventilation system (HPVS)/thermal control module (HTCM) is powered up an initialization process tests a value in memory against the same value in EEPROM for a match. If the values do not match, this DTC will be set.

DTC Parameters

DTC 45 will set if:

- HTCM memory (EEPROM) failure.
- DTC 45 will set when:

Each time the HTCM is awakened. Every time the system is powered up, it performs a self test that compares a value in EEPROM. If these two values do not match, this DTC will be set.

Failure Action

This DTC will be logged and the SERVICE SOON telltale will be turned ON.

Related DTCs

None

Telltale Illuminated

None

Other Controller Interfaces

None

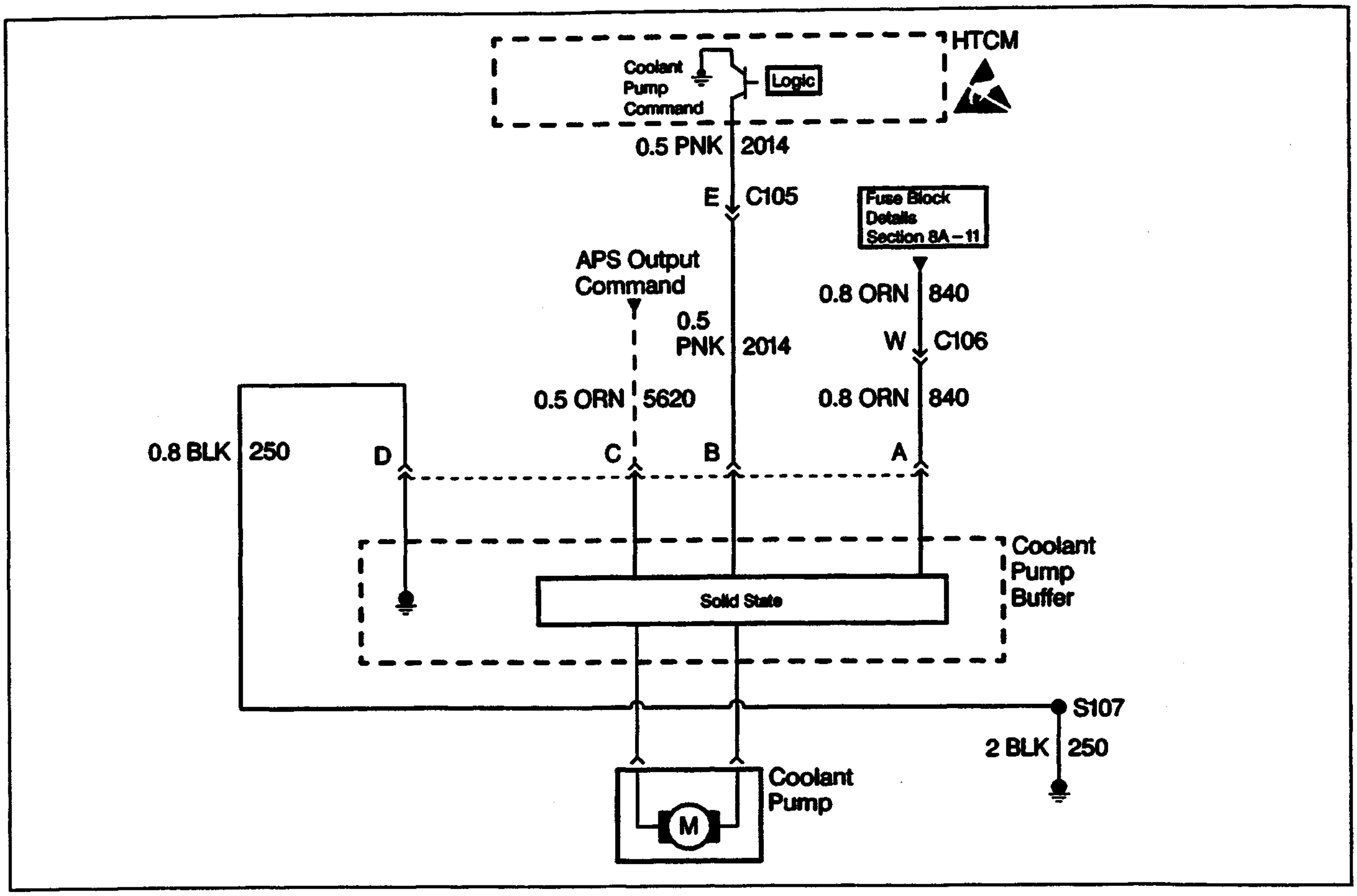
Diagnostic Aids

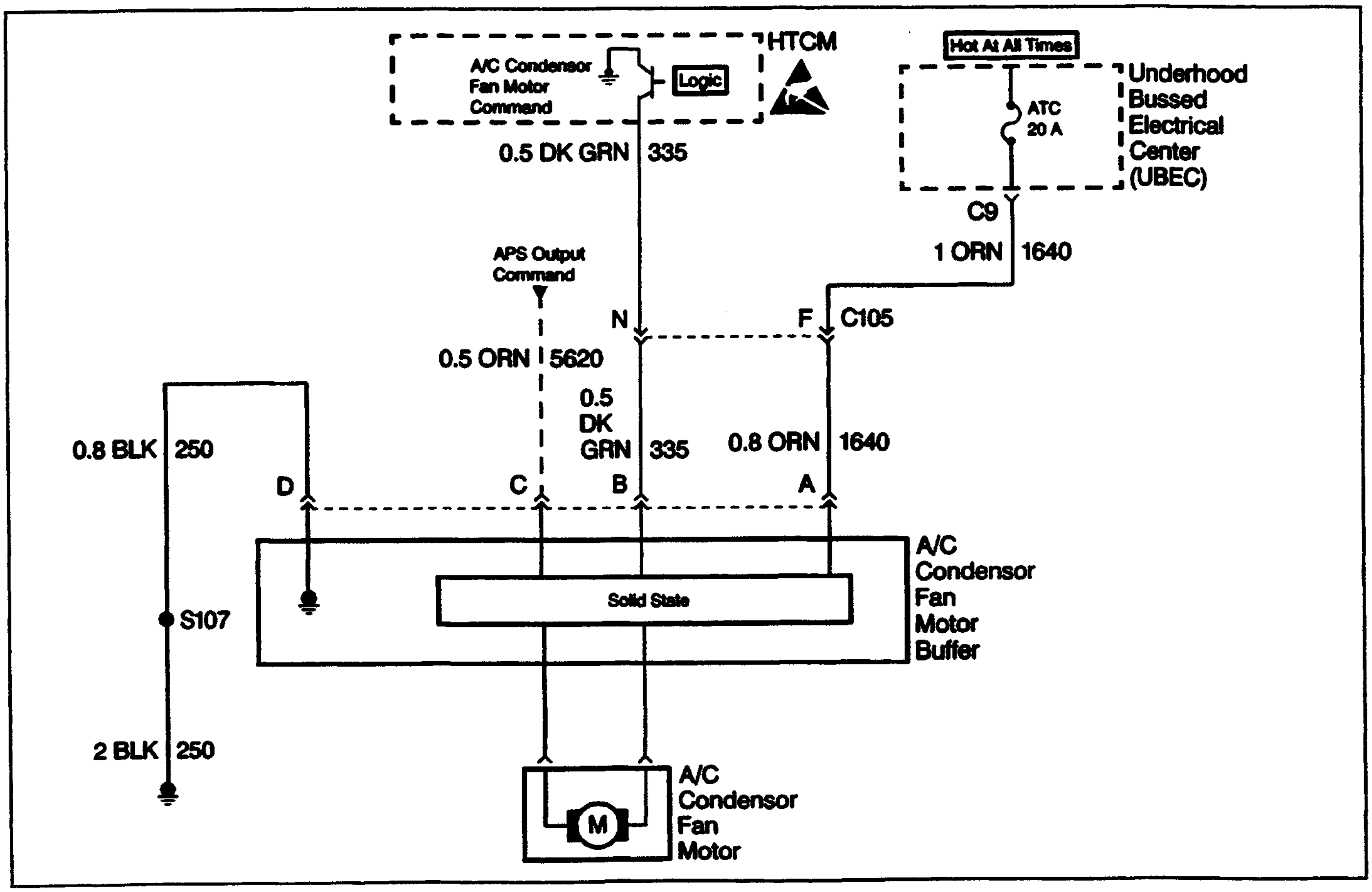
None

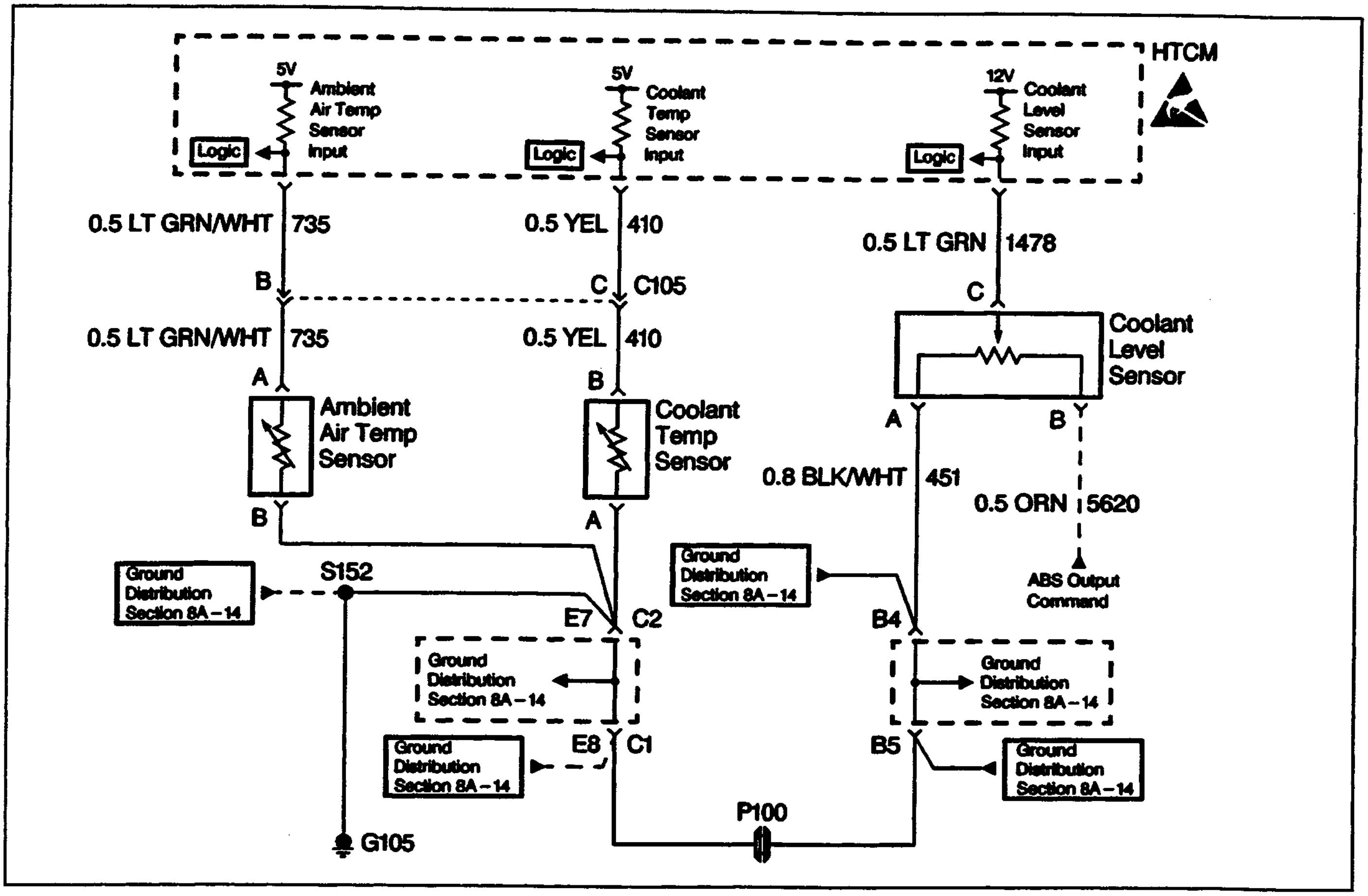
DTC 045 Memory Failure (ROM, EEPROM) Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record current and history HTCM DTC(s). 5. Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does the HTCM DTC 45 reset?	—	Go to Step 2	System OK
2	Replace HTCM. Is the action complete?	—	Go to Step 3	—
3	Install removed components and connectors. Clear DTC(s).	—	System OK	—

DTC 047 COOLANT OVER TEMPERATURE


HTCM
Coolant Pump Command
Logic
0.5 PNK 2014
E C105
Fuse Block Details Section 8A – 11
APS Output Command
0.5 PNK 2014
0.8 ORN 840
W C106
0.5 ORN 5620
0.8 ORN 840
0.8 BLK 250
D
C
B
A
Coolant Pump Buffer
Solid State
S107
2 BLK 250
Coolant Pump
M


HTCM
A/C Condensor Fan Motor Command
Logic
Hot At All Times
Underhood Bussed Electrical Center (UBEC)
ATC 20 A
0.5 DK GRN 335
C9
1 ORN 1640
APS Output Command
N
F C105
0.5 ORN 5620
0.5 DK GRN 335
0.8 ORN 1640
0.8 BLK 250
D
C
B
A
A/C Condensor Fan Motor Buffer
Solid State
S107
2 BLK 250
A/C Condensor Fan Motor
M


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
0.5 YEL 410
0.5 LT GRN 1478
B
C
C105
C
0.5 LT GRN/WHT 735
0.5 YEL 410
A
B
Coolant Level Sensor
Ambient Air Temp Sensor
Coolant Temp Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
B
A
ABS Output Command
Ground Distribution Section 8A-14
S152
Ground Distribution Section 8A-14
E7
C2
B4
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
E8
C1
B5
Ground Distribution Section 8A-14
P100
G105

Coolant Over Temperature

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The heat pump ventilation system (HPVS)/thermal control module (HTCM) provides a five volt signal to the temperature sensors, which ground through the right hand junction block. If the coolant temperature monitored by the pump coolant temperature (PCTS) is excessive, this DTC will be set.

DTC Parameters

DTC47 will set if:

- Cooling system failure.
- DTC 47 will set when:

Anytime the HTCM is awake. This fault exists if the coolant temperature measured by the PCTS exceeds 74.0°C (165.2°F) in Run mode or 60.0°C (140.0°F) while charging.

Failure Action

This DTC will be logged and the temperature (TEMP) telltale will be turned ON. The following over temperature actions are taken:

- Front end fan (FEF) and coolant pump are forced to high speed.
- (14.5V) APM voltage output (98% duty cycle).
- The coolant valve is forced to the radiator position.
- The heat pump is disabled.
- Charging disabled.
- Regenerative braking is disabled.

Related DTCs

BPM 296

Telltale Illuminated

Temperature (TEMP)

Other Controller Interfaces

None

Diagnostic Aids

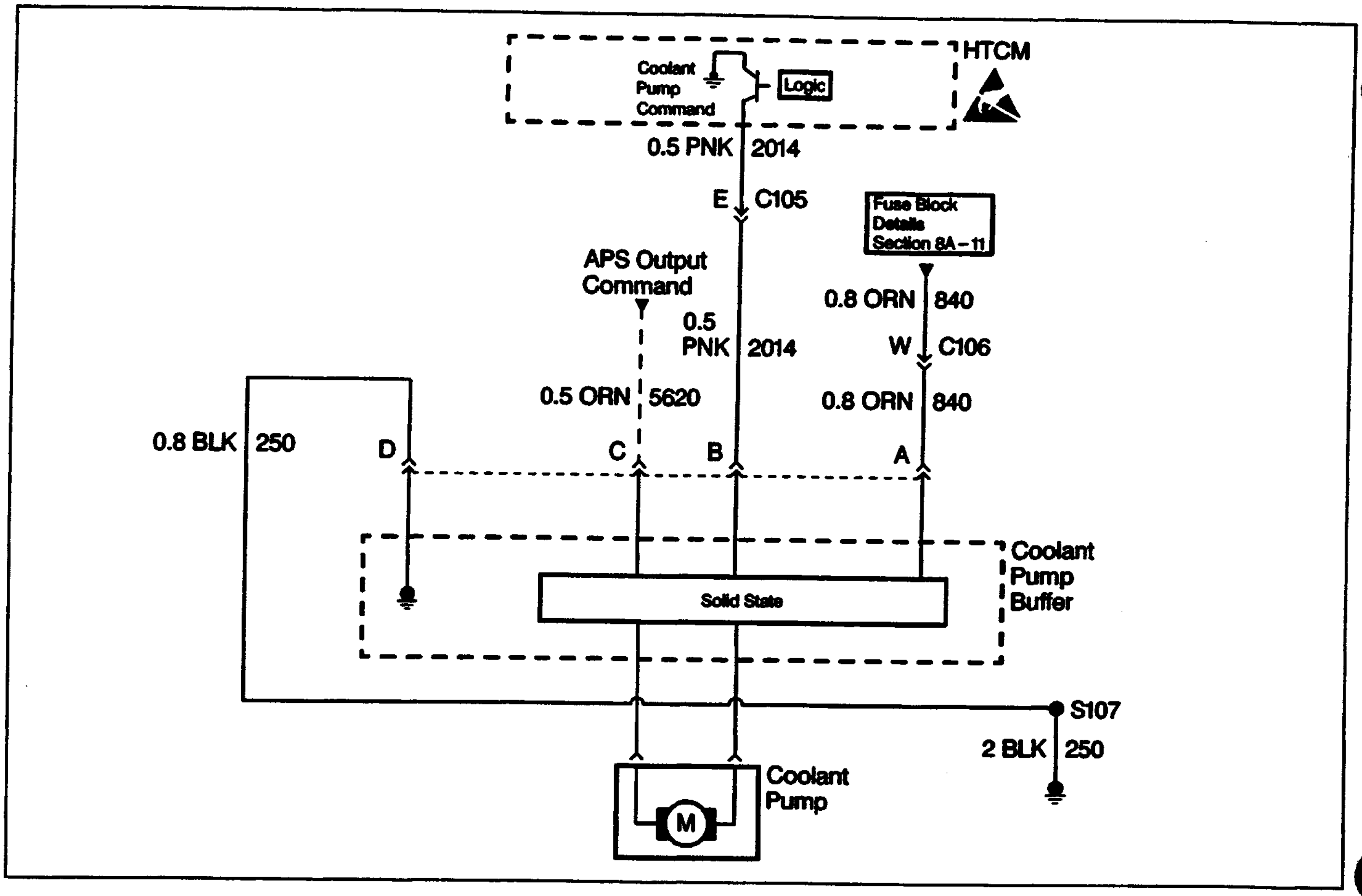
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 047 COOLANT OVER TEMPERATURE Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Are any PCM DTC(s) set?	—	Diagnose PCM DTC(s) first	Go to Step 2
2	Clear all DTC(s), cycle vehicle OFF and back ON and check for DTC(s) again. Did HTCM DTC 014 set?	—	Diagnose DTC 14 first	Go to Step 3
3	Check coolant level and repair any leaks. Did you complete this repair?	—	Go to Step 5	Go to Step 4
4	Did this DTC set during charging in hot weather?	—	Normal condition in hot weather	—
5	Call technical assistance.	—		

DTC 050 Coolant Pump


HTCM
Coolant Pump Command
Logic
0.5 PNK 2014
E C105
Fuse Block Details Section 8A-11
APS Output Command
0.5 PNK 2014
0.8 ORN 840
W C106
0.8 ORN 840
0.5 ORN 5620
0.8 BLK 250
D
C
B
A
Coolant Pump Buffer
Solid State
S107
2 BLK 250
Coolant Pump
M

DTC 050 Coolant Pump

The coolant pump is controlled via a pulse width modulated (PWM) signal to the motor control buffer. There is no direct feedback to indicate that a failure has occurred. However, if the coolant pump fails, the power inverter module (PIM) will heat up much more quickly than the coolant temperature at the pump. If the difference between the PIM temperature and the pump coolant temperature exceeds 15°C (59°F) then this fault is stored.

DTC Parameters

DTC50 will set if:

- Coolant pump buffer failure.
- Coolant pump failure.

DTC 50 will set when:

Anytime the HTCM is awake, after the first minute of operation. This fault logic is ignored for one minute after power-up to allow the temperature to equalize. This fault exists if the PIM temperature is 15° C (59° F) greater than the coolant temperature.

Failure Action

This DTC will be logged and the temperature (TEMP) telltale will be turned ON. The following over temperature actions are taken:

- The heat pump is disabled.
- Charging is disabled while in Run.
- Regenerative braking is disabled.

Related DTCs

HTCM DTC 07

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

- This DTC may set in high temperatures if the vehicle is driven aggressively (wide open throttle operation and/or up steep inclines).
- If the DTC was set under these conditions, it may be considered normal.
- This DTC may set if the pump coolant temperature sensor value becomes skewed.
- This condition may be checked by allowing the vehicle to soak to ambient temperature (this usually takes about three hours) and comparing the various temperature sensor readings using a scan tool.
- The sensors should read within three degrees of each other.
- Select data list from a scan tool HTCM menu.
- Check the tightness of the female terminal grip with a spare male terminal.

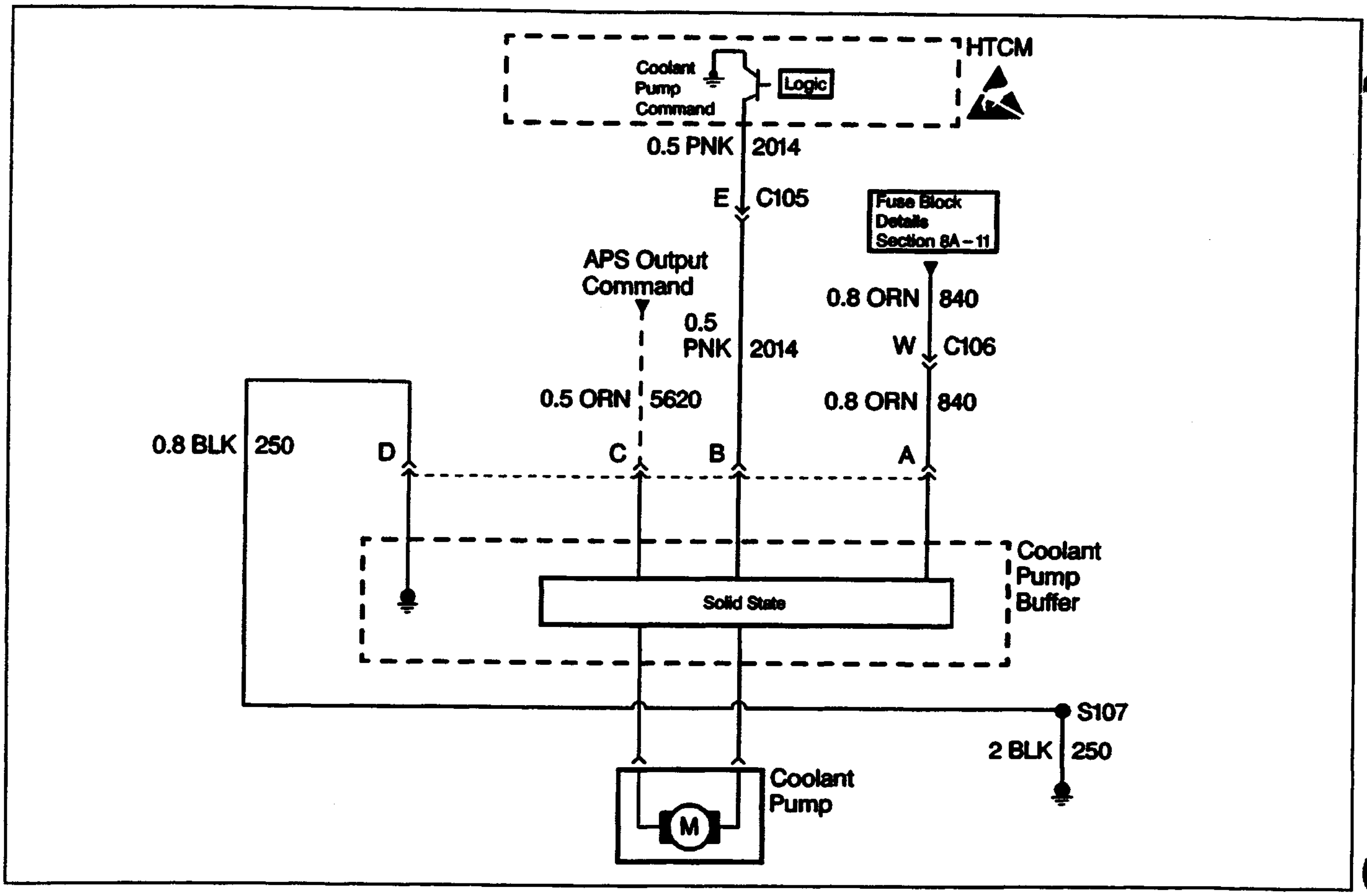
DTC 050 Coolant Pump Diagnosis

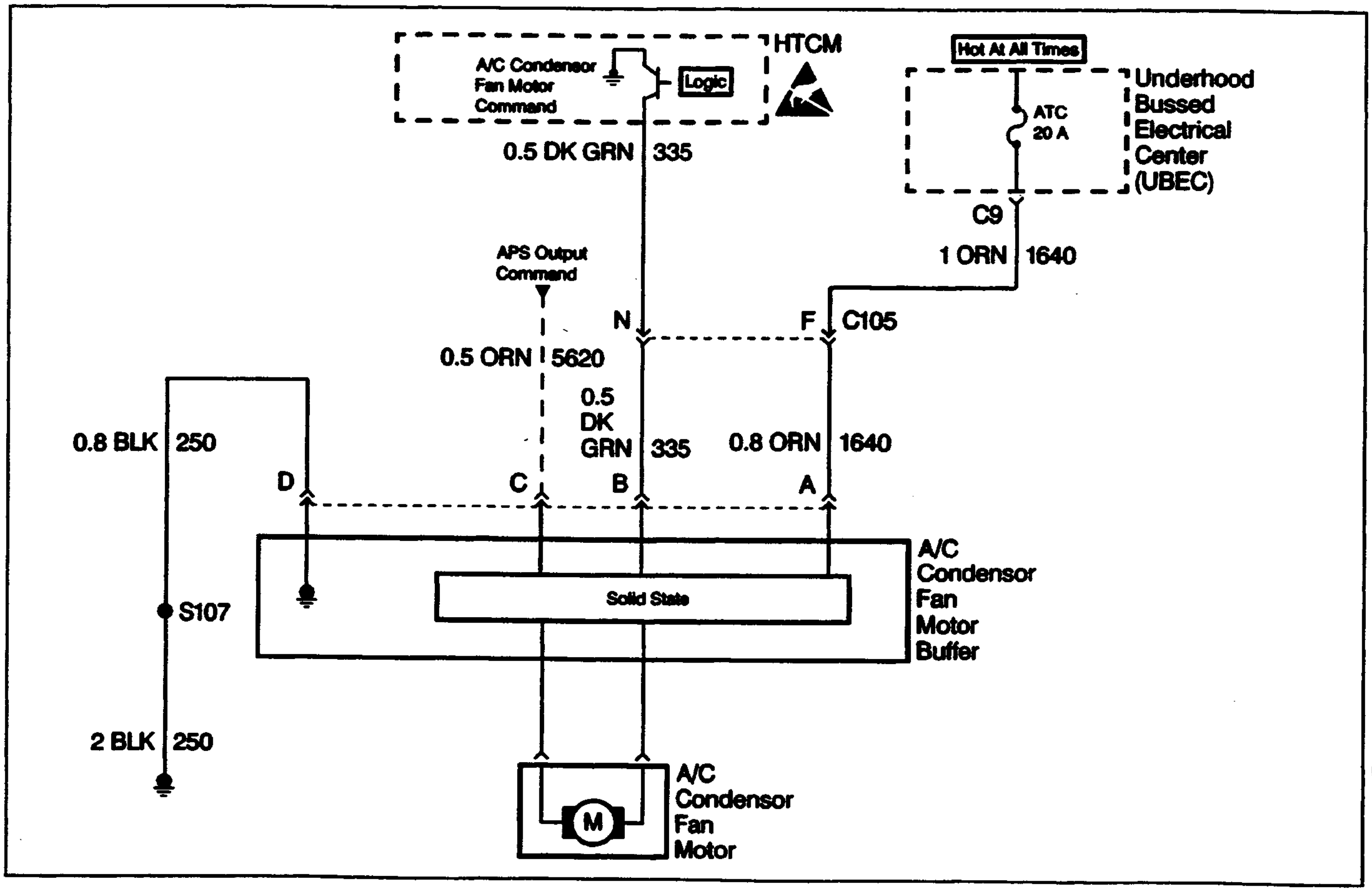
Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan Tool. 4. Read and record all current and history DTC(s). Are any PCM DTC(s) set?	—	Diagnose PCM DTC(s) first	Go to Step 2
2	Clear all DTC(s), cycle vehicle OFF and back ON and check for DTC(s) again. Is DTC 017 set?	—	Diagnose DTC 017 first	Go to Step 3
3	Does the coolant pump run? (Observe vent lines in coolant reservoir)	—	Go to Step 4	Refer to Diagnostic Aids
4	1. Turn ignition ON 2. Connect a digital multimeter between CKT 250 (BLK) wire cavity D at coolant pump buffer and ground. Is the voltage greater than the specified value?	0.3 volts	Go to Step 5	Go to Step 6
5	Check for poor ground CKT 250 (BLK) wire between coolant pump buffer pin D and ground. Did you complete the repair?	—	Go to Step 15	Go to Step 6
6	Check for voltage at pin A of the coolant pump buffer. Is voltage greater than specified?	10 volts	Go to Step 8	Go to Step 7
7	Locate and repair loss of voltage on CKT 840 (ORN) wire between coolant pump buffer and fuse block. Did you complete the repair?	—	Go to Step 15	Go to Step 8
8	Check for voltage at pin C of the coolant pump buffer. Is voltage greater than specified?	10 volts	Go to Step 10	Go to Step 9
9	Locate and repair loss of voltage on CKT 5620 (ORN) wire between power distribution and coolant pump buffer. Did you complete the repair?	—	Go to Step 15	Go to Step 10

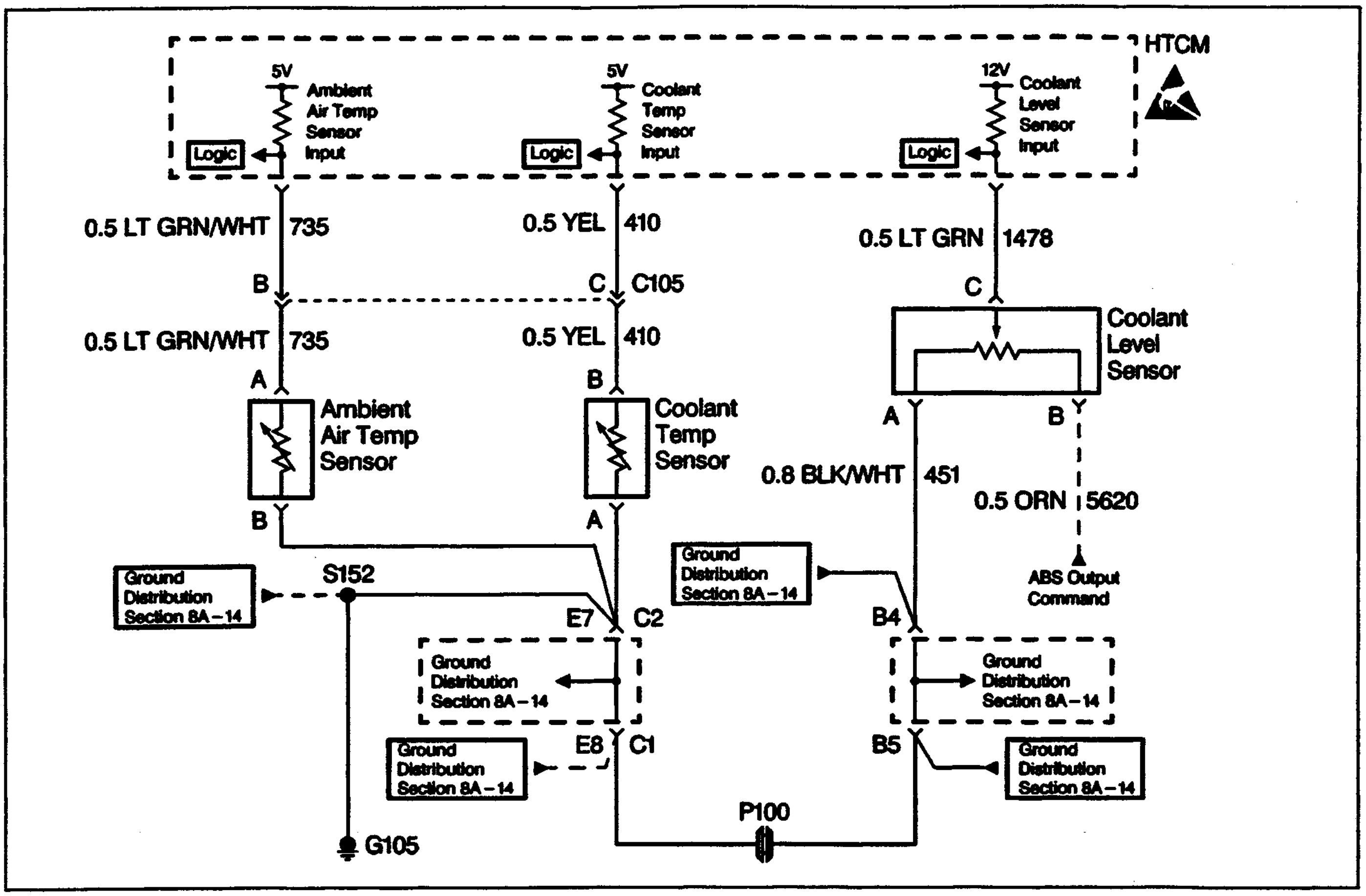
Step	Action	Value(s)	Yes	No
10	Backprobe pin B of the coolant pump buffer. Is voltage greater than specified?	1.0 volts	Go to Step 13	Go to Step 11
11	Backprobe pin C11 of the HTCM. Is voltage greater than specified?	1.0 volts	Go to Step 12	Go to Step 14
12	Locate and repair open in CKT 2014 (PNK) wire between the HTCM and coolant pump buffer. Did you complete the repair?	—	Go to Step 15	Go to Step 13
13	Replace coolant pump buffer. Is the action complete?	—	Go to Step 15	—
14	Test CKT 2014 (PNK) wire for a short to ground. If the wire is O.K., Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 15	—
15	Install removed components and connectors. Clear DTC(s).	—	System OK	—

BLANK

DTC 051 Coolant Temperature Compressor Override


HTCM
Coolant Pump Command
Logic
0.5 PNK 2014
E C105
Fuse Block Details Section 8A-11
APS Output Command
0.5 PNK 2014
0.8 ORN 840
W C106
0.5 ORN 5620
0.8 ORN 840
0.8 BLK 250
D
C
B
A
Coolant Pump Buffer
Solid State
S107
2 BLK 250
Coolant Pump
M


HTCM
A/C Condensor Fan Motor Command
Logic
Hot At All Times
ATC 20 A
Underhood Bussed Electrical Center (UBEC)
0.5 DK GRN 335
C9
1 ORN 1640
APS Output Command
N
F C105
0.5 ORN 5620
0.5 DK GRN 335
0.8 ORN 1640
0.8 BLK 250
D
C
B
A
A/C Condensor Fan Motor Buffer
Solid State
S107
2 BLK 250
A/C Condensor Fan Motor
M


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
0.5 YEL 410
0.5 LT GRN 1478
B
C
C105
C
0.5 LT GRN/WHT 735
0.5 YEL 410
Coolant Level Sensor
A
B
Ambient Air Temp Sensor
Coolant Temp Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
B
A
ABS Output Command
Ground Distribution Section 8A-14
S152
E7
C2
B4
Ground Distribution Section 8A-14
E8
C1
B5
P100
G105

DTC 051 Coolant Temperature Compressor Override

The temperature sensors are thermistors that change resistance with temperature change. The sensors have higher resistance as they get colder, lower resistance as temperatures increase. The heat pump ventilation system (HPVS)/thermal control module (HTCM) will attempt to control an overheating condition by limiting the heat pump speed, If the coolant temperature reaches 63° C (145° F), the HTCM will reduce/limit the compressor motor control (CMC) power requested to 1150 watts. If the coolant temperature reaches 66° C (150° F), the HTCM will reduce/limit the compressor motor control (CMC) power requested to 600 watts. If the coolant temperature is greater than 71° C (160° F), this DTC will be set, and the heat pump will be disabled.

DTC Parameters

DTC51 will set if:

- High ambient temperature/high load operation.
- Cooling system failure.

DTC 51 will set when:
Anytime the HTCM is awake.

Failure Action

This DTC will be logged and the SERVICE SOON light will be turned ON. The front end fan and coolant pump will be commanded to high speed (14.5v), the coolant valve will be forced to the radiator position, and the heat pump will be disabled.

Related DTCs

HTCM 14.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

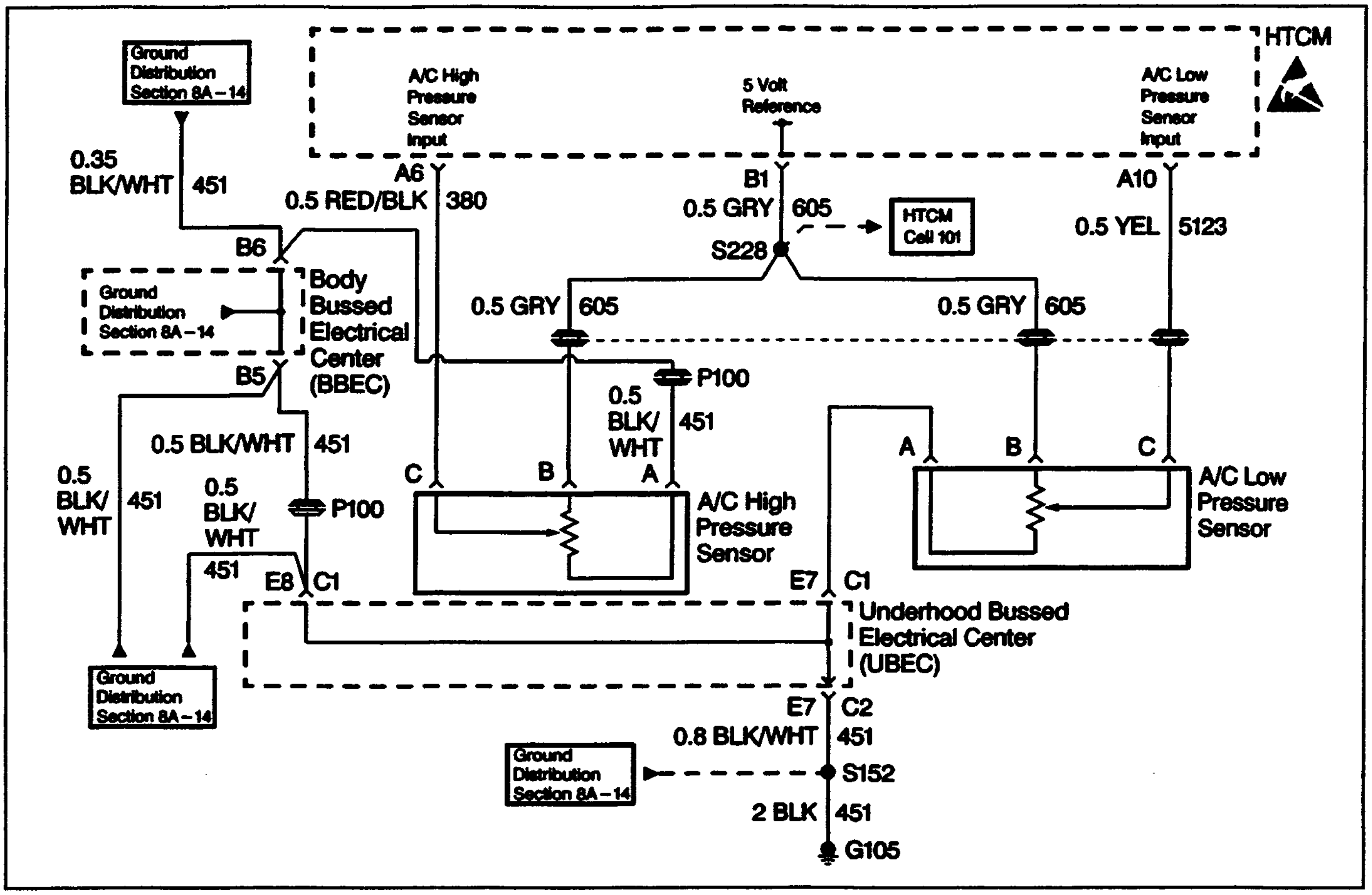
- This DTC may set in high temperatures if the vehicle is driven aggressively (wide open throttle operation and/or up steep inclines).
- If the DTC was set under these conditions, it may be considered normal.
- This DTC may set if the pump coolant temperature sensor value becomes skewed.
- This condition may be checked by allowing the vehicle to soak to ambient temperature (this usually takes about three hours) and comparing the various temperature sensor readings using a scan tool.
- The sensors should read within three degrees of each other.
- Select data list from a scan tool HTCM menu.
- Check the tightness of the female terminal grip with a spare male terminal.

DTC 051 Coolant Temperature Compressor Override Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Are any HTCM DTC(s) set?	—	Go to Appropriate DTC(s)	Go to Step 2
2	Clear all DTC(s), cycle vehicle OFF and back ON and check for DTC(s) again. Does cooling fan and coolant pump operate?	—	Refer to Cooling System Performance Check	Refer to Cooling Fan or Cooling Pump Inoperative trouble chart

BLANK

DTC 052 A/C Low Pressure


HTCM
A/C High Pressure Sensor Input
5 Volt Reference
A/C Low Pressure Sensor Input
Ground Distribution Section 8A-14
0.35 BLK/WHT 451
A6
0.5 RED/BLK 380
B1
0.5 GRY 605
HTCM Cell 101
S228
A10
0.5 YEL 5123
B6
Body Bussed Electrical Center (BBEC)
B5
0.5 GRY 605
0.5 GRY 605
P100
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
0.5 BLK/WHT 451
C B A
A/C High Pressure Sensor
A B C
A/C Low Pressure Sensor
E8 C1
E7 C1
Underhood Bussed Electrical Center (UBEC)
E7 C2
0.8 BLK/WHT 451
S152
2 BLK 451
G105

DTC 052 A/C Low Pressure

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal. The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors input from the transducers. If the input goes below normal, this fault will be set and the heat pump will be disabled.

DTC Parameters

DTC52 will set if:

- Low refrigerant charge.
- Blocked orifice tube.
- Reversing valve failure.

DTC 52 will set when:

Anytime the HTCM is awake and the heat pump is running. If the pressure falls below 20 kPa (3 psi) in heat or DeFex mode or below 100 kPa (14.5 psi) in cool mode.

Failure Action

This fault will be logged, the SERVICE SOON telltale will be turned ON, and heat pump operation will be disabled.

Related DTCs

HTCM 11, 16.

Telltale Illuminated

None

Other Controller Interfaces

None

Diagnostic Aids

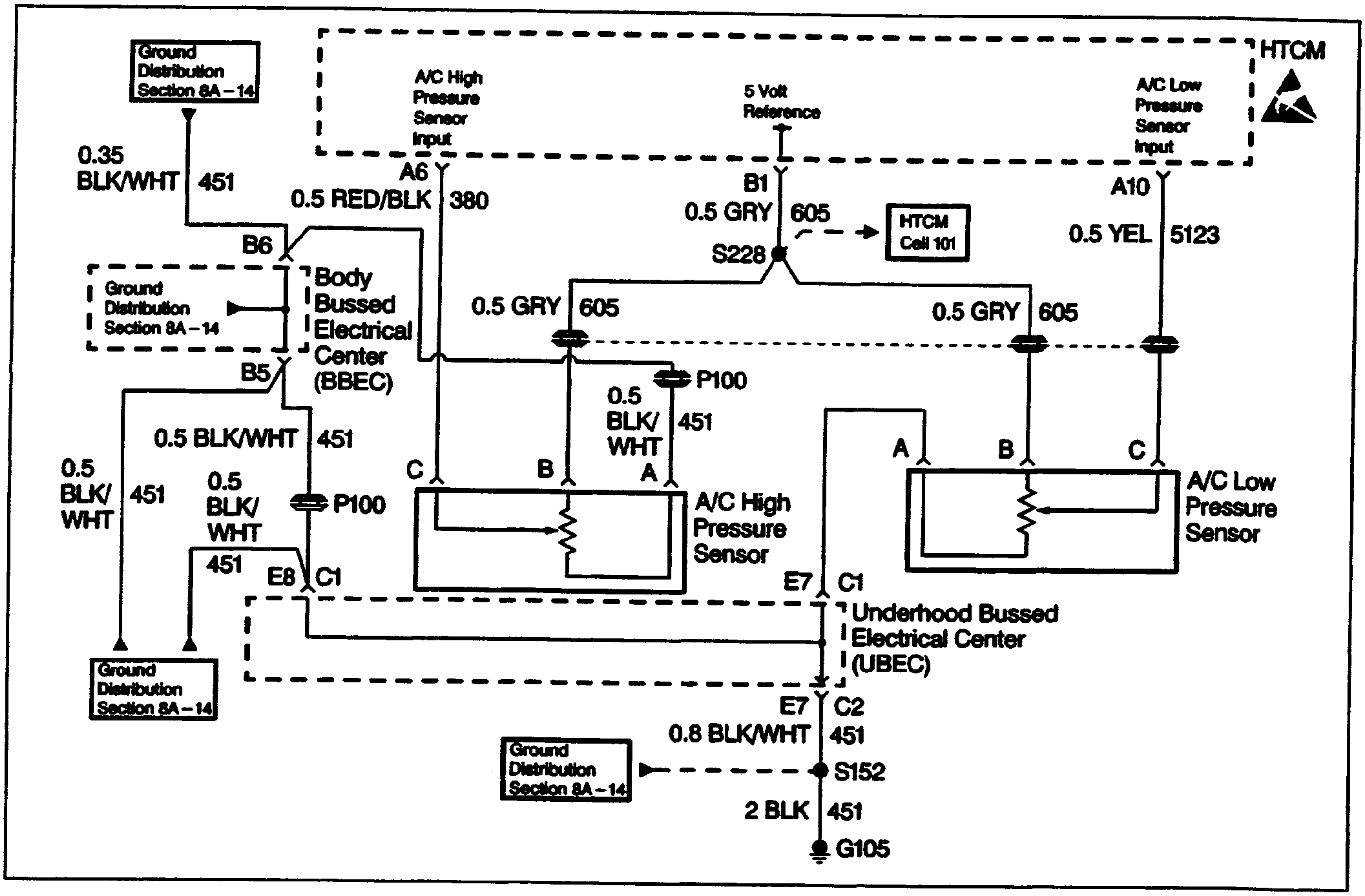
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 052 A/C Low Pressure Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. Connect a scan tool. 3. Read and record all current and history DTC(s). Is HTCM DTC 011 or 016 set?	—	Diagnose DTC(s) 011 or 016 first	Go to Step 2
2	1. Check system for leaks. 2. Refer to Leak Testing in Section 1B. Are there any leaks present?	—	Go to Step 3	Go to Step 4
3	Evacuate system, repair leaks, and recharge system. Did you complete the repair?	—	Go to Step 6	Go to Step 4
4	Evacuate system and record system capacity. Was refrigerant below specification?	2.0 lb	Go to Step 5	Refer to HVAC Performance Test
5	Recharge system with proper amount of refrigerant. Refer to Section 1B for procedures. Is the action complete?	—	Go to Step 6	
6	Install removed components and connectors. Clear DTC(s).	—		

DTC 053 A/C High Pressure



Ground Distribution Section 8A-14
A/C High Pressure Sensor Input
5 Volt Reference
A/C Low Pressure Sensor Input
HTCM
0.35 BLK/WHT 451
A6
0.5 RED/BLK 380
B1
0.5 GRY 605
HTCM Cell 101
A10
0.5 YEL 5123
S228
B6
Ground Distribution Section 8A-14
Body Bussed Electrical Center (BBEC)
0.5 GRY 605
0.5 GRY 605
B5
P100
0.5 BLK/ WHT 451
0.5 BLK/WHT 451
0.5 BLK/ WHT 451
0.5 BLK/ WHT
P100
451
C
B
A
A/C High Pressure Sensor
A
B
C
A/C Low Pressure Sensor
E8 C1
E7 C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution Section 8A-14
E7 C2
0.8 BLK/WHT 451
Ground Distribution Section 8A-14
S152
2 BLK 451
G105

DTC 053 A/C High Pressure

The pressure transducers convert capacitance change (which varies with pressure changes) to a 0 to 5 volt analog signal.

The heat pump ventilation system (HPVS)/thermal control module (HTCM) monitors input form the transducers. If the input goes above normal, this fault will be set and the heat pump will be disabled.

DTC Parameters

DTC53 will set if:

- Blocked orifice tube.
- Excessive refrigerant charge.
- CRFM condenser radiator fault module inop.

DTC 53 will set when:

Anytime the HTCM is awake and the heat pump is running. If pressure rises above 2800 kPa (406 psi), this DTC will set.

Failure Action

This fault will be logged, the SERVICE SOON telltale will be turned ON, and heat pump operation will be disabled.

Related DTCs

HTCM 10

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

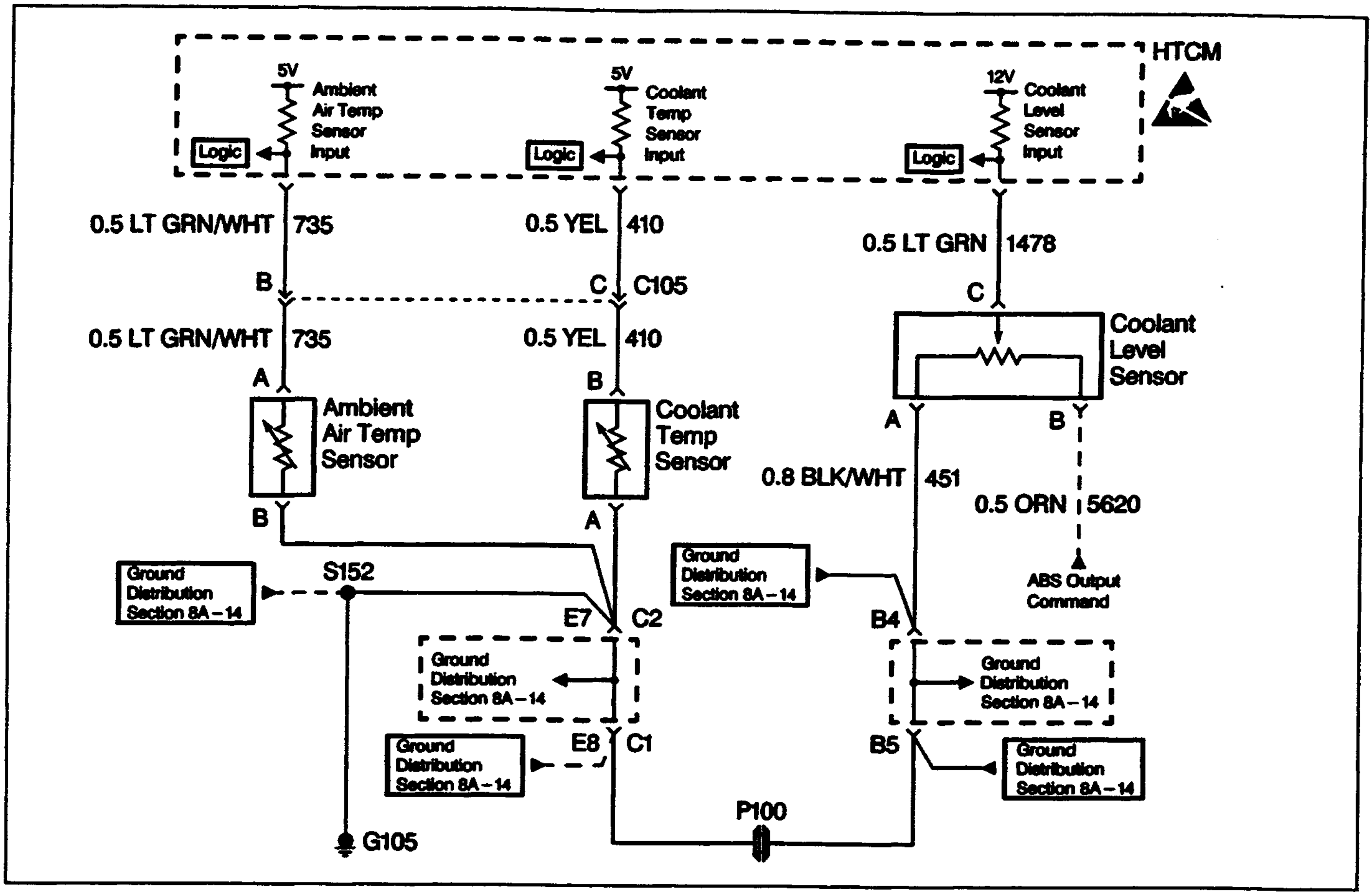
Check the tightness of the female terminal grip with a spare male terminal.

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 053 A/C High Pressure Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Is HTCM DTC 010 set?	—	Diagnose DTC 010 first	Go to Step 2
2	Activate compressor by selecting Heater A/C. Did cooling fan come one? Clear DTC(s).	—	Perform A/C System Performance Test in Section 1B	Refer to Cooling Fan Inoperative trouble chart in Section 1B

DTC 054 Low Coolant Level


HTCM
5V
Ambient Air Temp Sensor Input
Logic
5V
Coolant Temp Sensor Input
Logic
12V
Coolant Level Sensor Input
Logic
0.5 LT GRN/WHT 735
B
0.5 LT GRN/WHT 735
A
Ambient Air Temp Sensor
B
0.5 YEL 410
C C105
0.5 YEL 410
B
Coolant Temp Sensor
A
0.5 LT GRN 1478
C
Coolant Level Sensor
A
B
0.8 BLK/WHT 451
0.5 ORN 5620
ABS Output Command
Ground Distribution Section 8A-14
S152
E7 C2
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
B4
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
E8 C1
B5
Ground Distribution Section 8A-14
P100
G105

DTC 054 Low Coolant Level

The coolant level switch is a smart switch. The switch determines if coolant is present by pulsing a light emitting diode into the coolant, and monitoring its reflection with a phototransistor. The coolant level switch contains filtering to prevent false detection of low coolant. On power up, the coolant level switch drives its output low, then high. If the heat pump ventilation system (HPVS)/thermal control module (HTCM) does not detect this initialization test, a HTCM 17 will be set. If the coolant level switch input circuit fails after startup, or if low coolant is detected, this DTC will be set.

DTC Parameters

DTC54 will set if:

- Low coolant level.

DTC 54 will set when:

Anytime the HTCM is awake, if no DTC 17 has been set. When the vehicle is powered up, the coolant level switch performs a power up initialization test. If this test fails an HTCM 17 is set. If test passes, the coolant level switch is monitored for coolant level. If the coolant level switch detects low coolant, this fault is set. If the coolant level switch input circuit fails after startup, a 54 may be set. If the fault is present on the next Run cycle, a DTC 17 will be set.

Failure Action

The SERVICE SOON light will be turned ON. Information is passed (via serial data) to the PCM and BPM indicating that the coolant level is low. The following over temperature actions are taken:

- The heat pump is disabled.
- Charging is disabled.
- Regenerative braking is disabled.

Related DTCs

HTCM 17, BPM 296

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

The coolant level switch input circuit fails after startup, a DTC 54 may be set. If the fault is present on the next RUN cycle, a DTC 17 will be set. If an DTC 54 is found in history only, the following could cause intermittent problems:

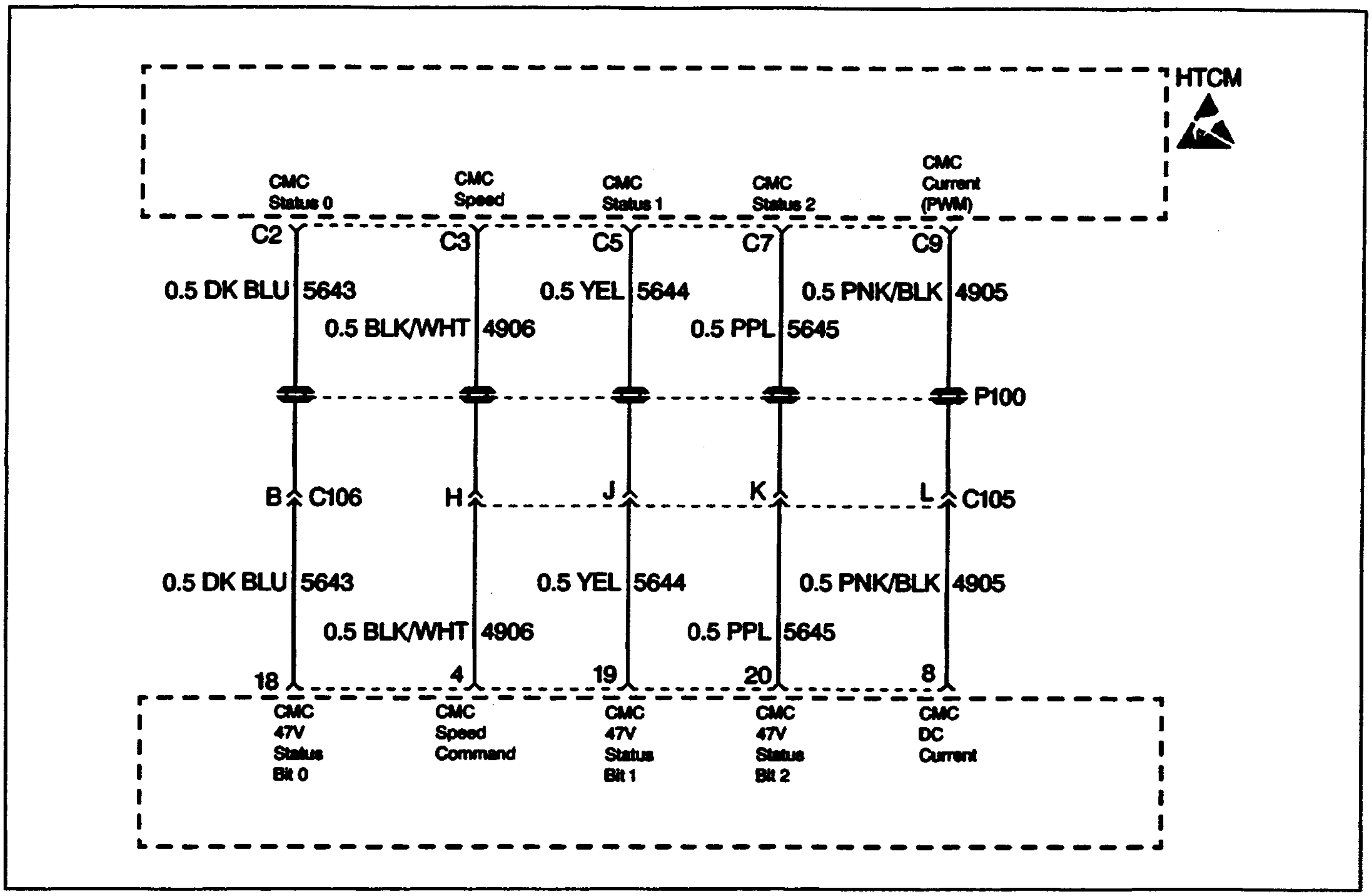
- coolant level switch input circuit open or shorted to voltage or ground.
- coolant level switch Run 1 circuit open or shorted to ground.
- coolant level switch ground circuit open.
- Faulty coolant level sensor.
- HTCM failure. When attempting to diagnoses an intermittent problem, use a scan tool and review malfunction history diagnostic information. This data can be used to determine the condition that were present when the DTC set.
- Select data list from a scan tool HTCM menu.

Check the tightness of the female terminal grip with a spare male terminal.

DTC 054 Low Coolant Level Diagnosis

Step	Action	Value(s)	Yes	No
1	Is coolant level low?	—	Go to Step 2	Go to Step 3
2	1. Add coolant to reservoir. Refer to Section 6B. 2. Check for leaks. Verify DTC does not reset.	—	Go to Step 3	System Normal Refer to Diagnostic Aids
3	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). Is HTCM DTC 017 set?	—	Diagnose HTCM DTC 017 first	Go to Step 4
4	1. Clear all DTC(s). 2. Cycle vehicle OFF and back ON. 3. Check for DTC(s) again. Did DTC 054 reset?	—	Go to Step 5	See Diagnostic Aids
5	Replace coolant level switch. Refer to Section 6B. Is the action complete?	—	Go to Step 6	
6	Install removed components and connectors. Clear DTC(s).	—		

DTC 061 HTCM Status Line 2


HTCM
CMC Status 0
CMC Speed
CMC Status 1
CMC Status 2
CMC Current (PWM)
C2
C3
C5
C7
C9
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
P100
B C106
H
J
K
L C105
0.5 DK BLU 5643
0.5 BLK/WHT 4906
0.5 YEL 5644
0.5 PPL 5645
0.5 PNK/BLK 4905
18
4
19
20
8
CMC 47V Status Bit 0
CMC Speed Command
CMC 47V Status Bit 1
CMC 47V Status Bit 2
CMC DC Current

DTC 061 HTCM Status Line 2

Because the accessory power module (APM) does not communicate on the serial data line, it does not store diagnostic trouble DTCs.

The heat pump ventilation system (HPVS)/thermal control module (HTCM) serves as an interface to the APM by storing several APM related diagnostic trouble DTCs and providing status information over serial data.

APM status is communicated to the HTCM via six discrete digital interface wires. The APM indicates status and fault conditions by driving these lines high or low. The APM toggles 47V/CMC status line 2 high and low once every second for one second to allow 47 volt and compressor motor control (CMC) fault detection at the same time. If status line 2 fails to toggle for the three consecutive cycles, this fault will be reported.

DTC Parameters

DTC61 will set if:

- Open or short circuit on 47V/CMC status line 2.
- HTCM fault.
- APM fault.

DTC 61 will set when:
Anytime the HTCM is awake.

Failure Action

This DTC will be logged. Faults that are normally detected via the 47V/CMC status lines will be ignored while this fault is present.

Related DTCs

None

Telltale Illuminated

SERVICE SOON.

Other Controller Interfaces

None

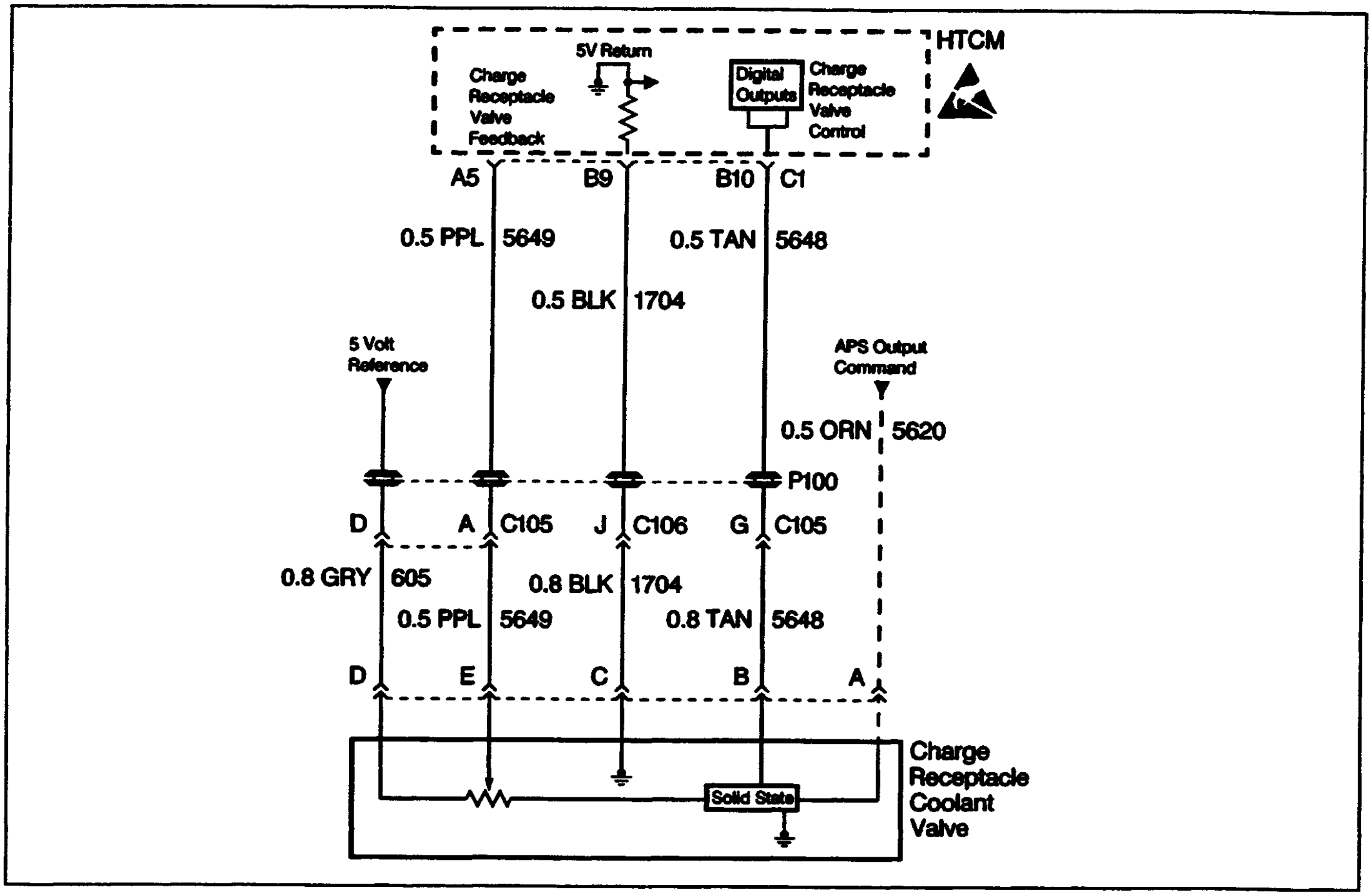
Diagnostic Aids

Check the tightness of the female terminal grip with a spare male terminal. If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 061 HTCM Status Line 2 Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history DTC(s). 5. Clear all DTC(s). 6. Cycle vehicle OFF and back ON. 7. Check for DTC(s) again. Did DTC 061 reset?	—	Go to Step 2	See Diagnostic Aids
2	1. Turn ignition OFF. 2. Remove Service Disconnect connector. 2. Disconnect APM connector. 4. Connect a digital multimeter between CKT 5645 (PPL) wire cavity 20 and ground. Is the resistance within the specified values?	100k - 200k Ohms	Go to Step 3	Go to Step 4
3	Replace APM. Refer to Section 6A. Is the action complete?	—	Go to Step 6	
4	Locate and repair open or short to ground in CKT 5645 (PPL) wire. If circuit is O.K., replace HTCM. Refer to Section 1B. Did you complete the repair?	—	Go to Step 6	Go to Step 5
5	Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 6	
6	Install removed components and connectors. Clear DTC(s).	—		

DTC 062 Charge Receptacle Valve Feedback Circuit


HTCM
5V Return
Charge Receptacle Valve Feedback
Digital Outputs
Charge Receptacle Valve Control
A5
B9
B10
C1
0.5 PPL 5649
0.5 BLK 1704
0.5 TAN 5648
5 Volt Reference
APS Output Command
0.5 ORN 5620
P100
D
A C105
J C106
G C105
0.8 GRY 605
0.8 BLK 1704
0.5 PPL 5649
0.8 TAN 5648
D
E
C
B
A
Solid State
Charge Receptacle Coolant Valve

DTC 062 Charge Receptacle Valve Feedback Circuit

The actuator position is monitored by the heat pump ventilation system (HPVS)/thermal control module (HTCM) via a feedback circuit. If a fault is detected on the feedback input circuit, this fault will be set.

DTC Parameters

DTC62 will set if:.list0 Short to ground in the charge receptacle valve feedback circuit.

- Valve feedback circuit.
- Faulty charge receptacle valve actuator.
- HTCM failure.

DTC 62 will set when:

Anytime the HTCM is awake. This fault exists if the HTCM detects less than 0.06 volts on the charge receptacle valve feedback input circuit.

Failure Action

This DTC will be logged, and the SERVICE SOON telltale will be illuminated.

Related DTCs

HTCM 10, 11, 22, 24

Telltale Illuminated

SERVICE SOON

Other Controller Interfaces

None

Diagnostic Aids

If the problem is intermittent, wiggle the wire harness while viewing a scan tool and see if the value changes or the DTC sets.

DTC 062 Charge Receptacle Valve Feedback Circuit Diagnosis

Step	Action	Value(s)	Yes	No
1	1. Turn ignition ON. 2. **IMPORTANT:** Charge paddle must not be inserted into the charge receptacle, remove if inserted. 3. Connect a scan tool. 4. Read and record all current and history HTCM DTC(s). Are HTCM DTC(s) 010, 011, 022 or 024 set?	—	Diagnose other codes first.	Go to Step 2
2	Clear HTCM DTC(s), then cycle vehicle OFF and back ON. Does DTC reset?	—	Go to Step 3	Problem is intermittent. Refer to Diagnostic Aids
3	Backprobe HTCM 24 pin connector pin A5. Is the voltage less than specification in Run?	0.15 volts	Go to Step 4	Go to Step 7
4	1. Disconnect DTC 062 Charge Receptacle coolant valve connector. 2. Check voltage at HTCM Pin A5. Is the voltage less than specification?	0.06 volts	Go to Step 5	Go to Step 6
5	Locate and repair short to ground in circuit 5648. Did you complete the repair?	—	Go to Step 8	Go to Step 6
6	Replace DTC 062 Charge Receptacle coolant valve. Is the action complete?	—	Go to Step 8	
7	Replace HTCM. Refer to Section 1B. Is the action complete?	—	Go to Step 8	
8	Install removed components and connectors. Clear DTC(s).	—		

BLANK

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DIAGNOSTIC INFORMATION

The Electrical Diagnosis section contains the following types of diagnostic information (the way in which the information is arranged may vary from system to system or vehicle to vehicle):

- Electrical Schematics.
- Component Location Lists.
- Harness Connector Faces.
- System Checks.
- System Diagnosis.
- Circuit Operation Descriptions.

Using these elements together will make electrical troubleshooting faster and easier. Each element is described below.

The **Circuit Schematic** shows the electrical current paths when a circuit is operating properly. It is essential to understand how a circuit should work before trying to diagnose a failure.

The **Component Location List** helps to find where the components of a system can be located. A brief statement of the location is given and also a reference to a drawing that shows the component and its connecting wires. These **Component Location Views** are in SECTION 8A-201.

The **Connector End Views** show the cavity or terminal locations in all the 4 pin or larger connectors shown in the schematic. Together with the wire colors and terminals given in the schematic, they help locate test points. The drawings show the connector faces as seen after the harness connector has been disconnected from a component or mating connector.

The **System Check** gives a summary of how the system should be operated and what should happen. This is especially important when working on a new system. The System Check will help identify symptoms, lead to diagnosis and confirm normal operation of the system after repair.

The **System Diagnosis** provides a procedure to follow that will locate the condition in a circuit causing a malfunction. If your own knowledge of the system and the Troubleshooting Hints have not produced a quick fix, follow the System Diagnosis. All procedures are based on symptoms to assist in locating the condition as fast as possible.

The **Circuit Operation** describes the components and how the circuit works.

SECTION/PAGE NUMBER

Sections are organized by subsystems with most containing a circuit schematic and the associated text. This makes the section easy to use, since the page number will stay the same year after year. For example, the cruise control schematic will always begin on page 8A-34-0. The other information for cruise control follows and is paged 8A-34-1, 8A-34-2, etc.

Some sections may have more than one circuit schematic, such as Power Distribution, Interior Lights and Air Conditioning. The circuit of interest can either be located by using the Index or by a quick look through the related section.

All the engine circuits for a particular engine VIN type are in the same section. This makes that section easy to use, since schematics for other engines are not in your way. The Instrument Panel schematics are organized similarly. If you are working on a vehicle with a Digital Cluster, only the schematics that apply to that vehicle's Digital Cluster will be in the section you use. Information on the Indicators and Gauges Clusters will be in other sections.

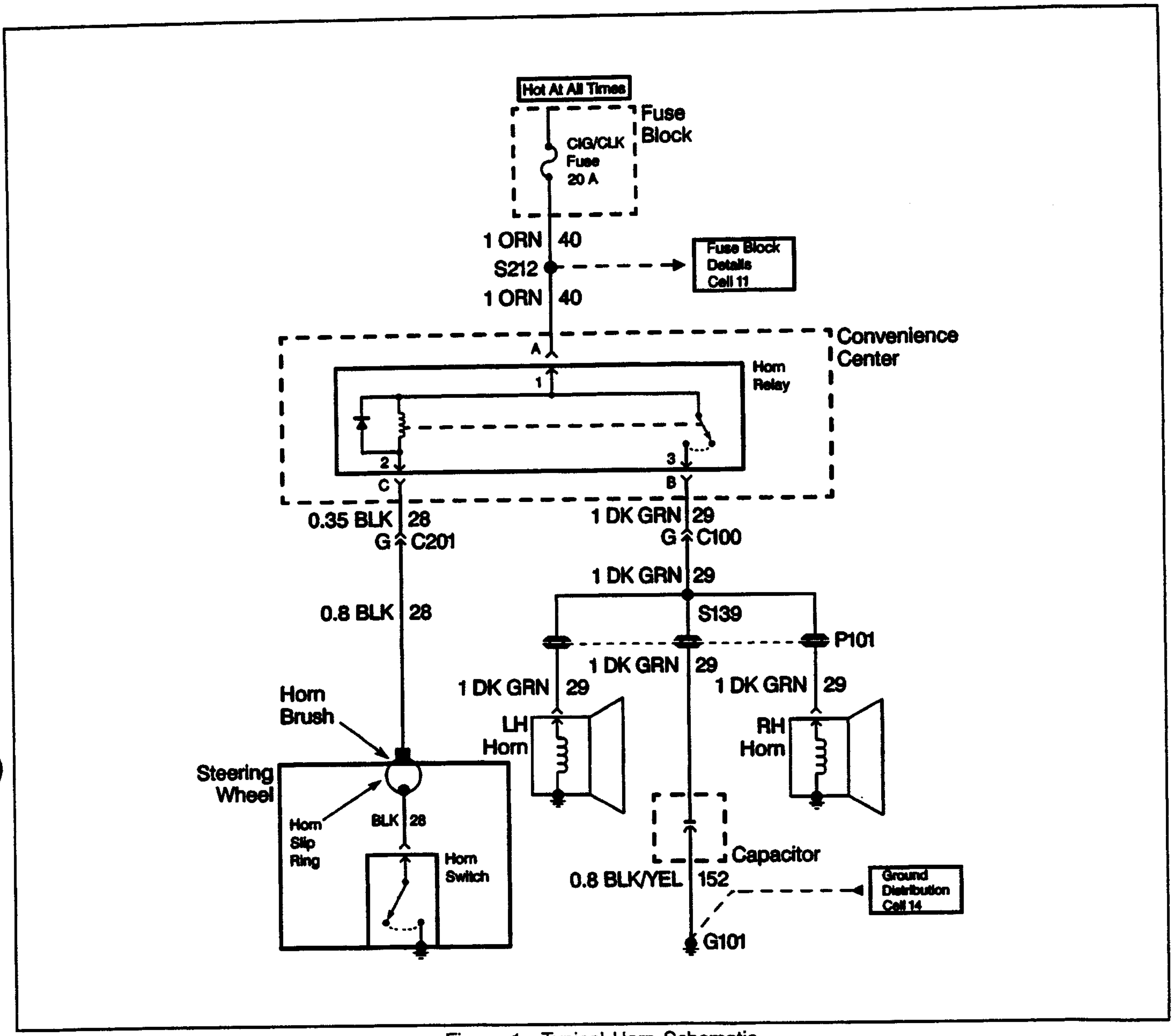
Hot At All Times
Fuse Block
CIG/CLK Fuse 20 A
1 ORN 40
S212
1 ORN 40
Fuse Block Details Cell 11
Convenience Center
A
Horn Relay
1
2
3
C
B
0.35 BLK 28
G C201
1 DK GRN 29
G C100
1 DK GRN 29
S139
P101
0.8 BLK 28
1 DK GRN 29
1 DK GRN 29
1 DK GRN 29
Horn Brush
LH Horn
RH Horn
Steering Wheel
Horn Slip Ring
BLK 28
Horn Switch
Capacitor
0.8 BLK/YEL 152
Ground Distribution Cell 14
G101

Figure 1—Typical Horn Schematic

SCHEMATICS

Schematics break the entire electrical system down into individual circuits. Wiring which is not part of the circuit of interest is referenced to another page, where the circuit is shown complete.

Important:

- It is important to realize that no attempt is made on the schematic to represent components and wiring as they physically appear on the vehicle. For example, a 4-foot length of wire is treated no differently in a schematic from one which is only a few inches long. The number of cavities for each connector is listed in the Connector End View Section. Similarly, switches and other components are shown as simply as possible, with regard to function only.

When diagnosing a Horn problem, the technician would reference the Horn section. The schematic in Figure 1 is a typical example of what would be found in a Horn section of SECTION 8A, along with the following text.

Voltage is applied to the Horn Relay at all times. When the relay coil is grounded by closing the Horn Switch, the relay contacts close. When the relay contacts are closed, both the LH and RH Horns are energized.

COMPONENT LOCATIONS

To locate the schematic components on the vehicle, use the Component Location List. Refer to "Typical Entries in the Component Location List."

Listed in the left hand column are the components, connectors, grounds and splices shown on the schematic. To the right of the component is the location, "Under RH

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side of I/P." Reference to LH and RH is made as though the technician was sitting in the driver's seat. On the same line, in the next two columns, are page and figure references for SECTION 8A-201, "Component Location Views." In this case, you are directed to Figure 4 on page 8A-201-1.

Grounds are listed next in the table. The location description for G101 reads, "Behind LH composite headlamp." You are directed to page 8A-201-8, Figure 14.

Nearly every component, connector, ground or splice shown on a schematic can be pinpointed visually by using the Component Location View figures.

Typical Entries in the Component Location List

COMPONENT	LOCATION	201-PG	FIG.	CONN
Convenience Center	Under RH side of I/P	1	4	
Fuse Block	Behind I/P compartment door	0	2	
C100	Mounted to LH hood hinge	7	11	202-0
C210	Above convenience center, behind I/P compartment	18	23	202-2
G101	Behind LH composite headlamp	8	14	
S139	Forward lamp wiring harn, behind RH composite headlamp	8	15	
S212	I/P wiring harn, behind I/P, above steering column	6	8	

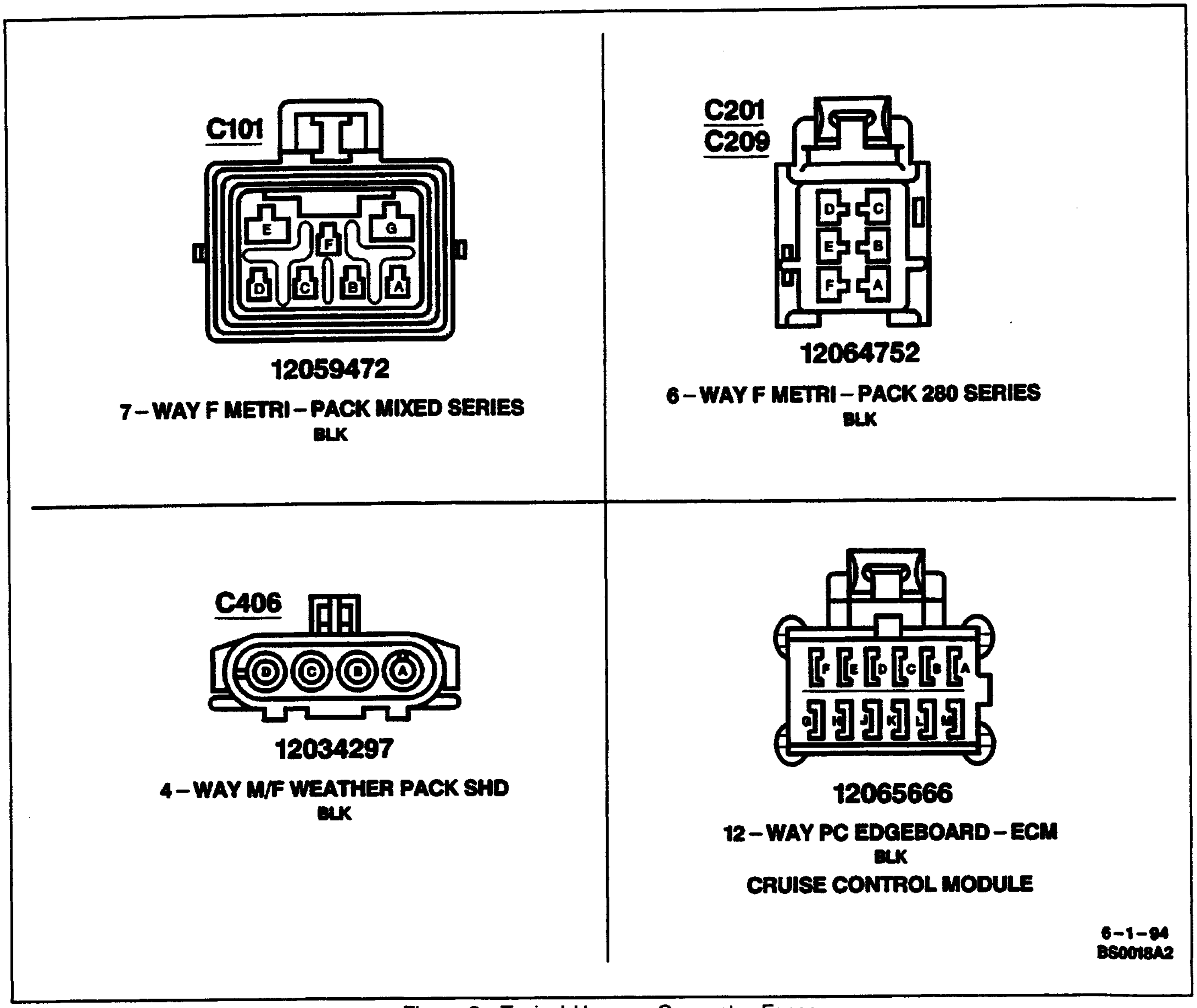

C101
E
G
F
D
C
B
A
12059472
7-WAY F METRI-PACK MIXED SERIES
BLK
C201
C209
D
C
E
B
F
A
12064752
6-WAY F METRI-PACK 280 SERIES
BLK
C406
D
C
B
A
12034297
4-WAY M/F WEATHER PACK SHD
BLK
F
E
D
C
B
A
G
H
J
K
L
M
12065666
12-WAY PC EDGEBOARD-ECM
BLK
CRUISE CONTROL MODULE
6-1-94
BS0018A2

Figure 2—Typical Harness Connector Faces

CONNECTOR END VIEWS

The connectors (see Figure 2) are labeled with the component they are connected to, or the connector number. In addition the color of the connector is given along with the family/series name.

If you need to backprobe a connector while it is on the component (refer to page 8A-4-3 for probing procedures), the order of the terminals must be mentally reversed. The wire color is a help in this situation. If there is more than one wire of the same color, you may need to locate a test point from its terminal number. A useful trick is to imagine that you are probing a terminal from behind the page you are looking at. Then mentally locate that terminal with respect to the keyway or other reference mark.

OTHER INFORMATION

VIN REFERENCES

If schematics for more than one variation of an engine type (V6, for example) are shown, then the schematics will be labeled with VIN designation to distinguish the variations.

SERVICE PARTS IDENTIFICATION LABEL

To aid service and parts personnel in identifying options and parts originally installed, a Service Parts Identification Label has been placed in the vehicle. Refer to General Information, SECTION 0A, for the location of the label and the definition of the option codes.

INTRODUCTION

ABBREVIATIONS

A/C	Air Conditioning
CKT	Circuit
CONN	Connector
EBCM	Electronic Brake Control Module
EBTCM	Electronic Brake and Traction Control Module
ECM	Engine Control Module
HARN	Harness
I/P	Instrument Panel
IPC	Instrument Panel Cluster
LH	Left Hand
PCM	Powertrain Control Module
RH	Right Hand
TERM	Terminal

For a list of additional abbreviations, refer to SECTION 0A.

POWER DISTRIBUTION

The Power Distribution schematic shows the wiring from the Battery, the Auxiliary Power Control Module, Fuse Block, Ignition Switch and Light Switch. The first component after a Fusible Link is also shown. In certain instances, the first component after a Fuse Block fuse and Light Switch is also shown.

The Power Distribution schematic refers to Fuse Block Details or the appropriate section schematics. By using these schematics, power distribution wiring can be followed from the Battery and Auxiliary Power Control Module to the first component after a Fusible Link, Fuse or Light Switch. The ability to follow the power distribution wiring to the first component in each circuit is extremely helpful in locating short circuits which cause fusible links and fuses to open.

Figure 3 is a sample Power Distribution schematic. It shows how voltage is applied from the positive battery terminal to the various circuits on the vehicle. For example, battery voltage is applied to the Starter Solenoid, Fusible Link D, Fuses 1 and 2 in the Fuse Block and the Light Switch in the LH Pod. These fuses are said to be "Hot At All Times", since battery voltage is always applied to them.

Notice that battery voltage is also applied to "Fusible Link F" and "Coolant Fan Relay."

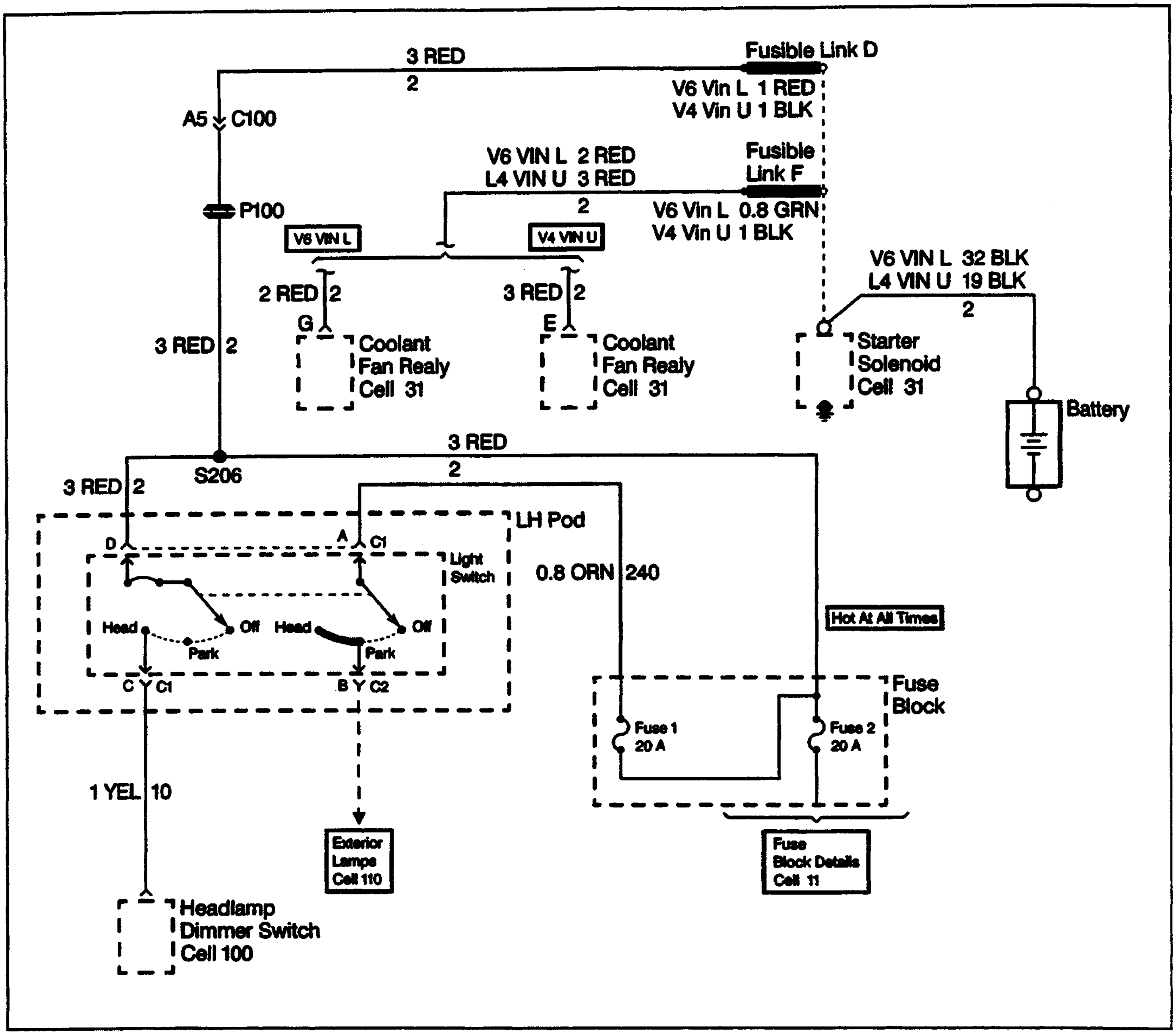

3 RED
2
Fusible Link D
V6 Vin L 1 RED
V4 Vin U 1 BLK
A5
C100
V6 VIN L 2 RED
L4 VIN U 3 RED
Fusible Link F
2
V6 Vin L 0.8 GRN
V4 Vin U 1 BLK
P100
V6 VIN L
V4 VIN U
V6 VIN L 32 BLK
L4 VIN U 19 BLK
2
2 RED 2
G
Coolant Fan Realy Cell 31
3 RED 2
E
Coolant Fan Realy Cell 31
Starter Solenoid Cell 31
Battery
3 RED 2
3 RED
2
S206
3 RED 2
LH Pod
D
A
C1
Light Switch
Head
Off
Park
Head
Off
Park
C
C1
B
C2
0.8 ORN 240
Hot At All Times
Fuse Block
Fuse 1 20 A
Fuse 2 20 A
1 YEL 10
Exterior Lamps Cell 110
Fuse Block Details Cell 11
Headlamp Dimmer Switch Cell 100

Figure 3—Typical Power Distribution Schematic

INTRODUCTION

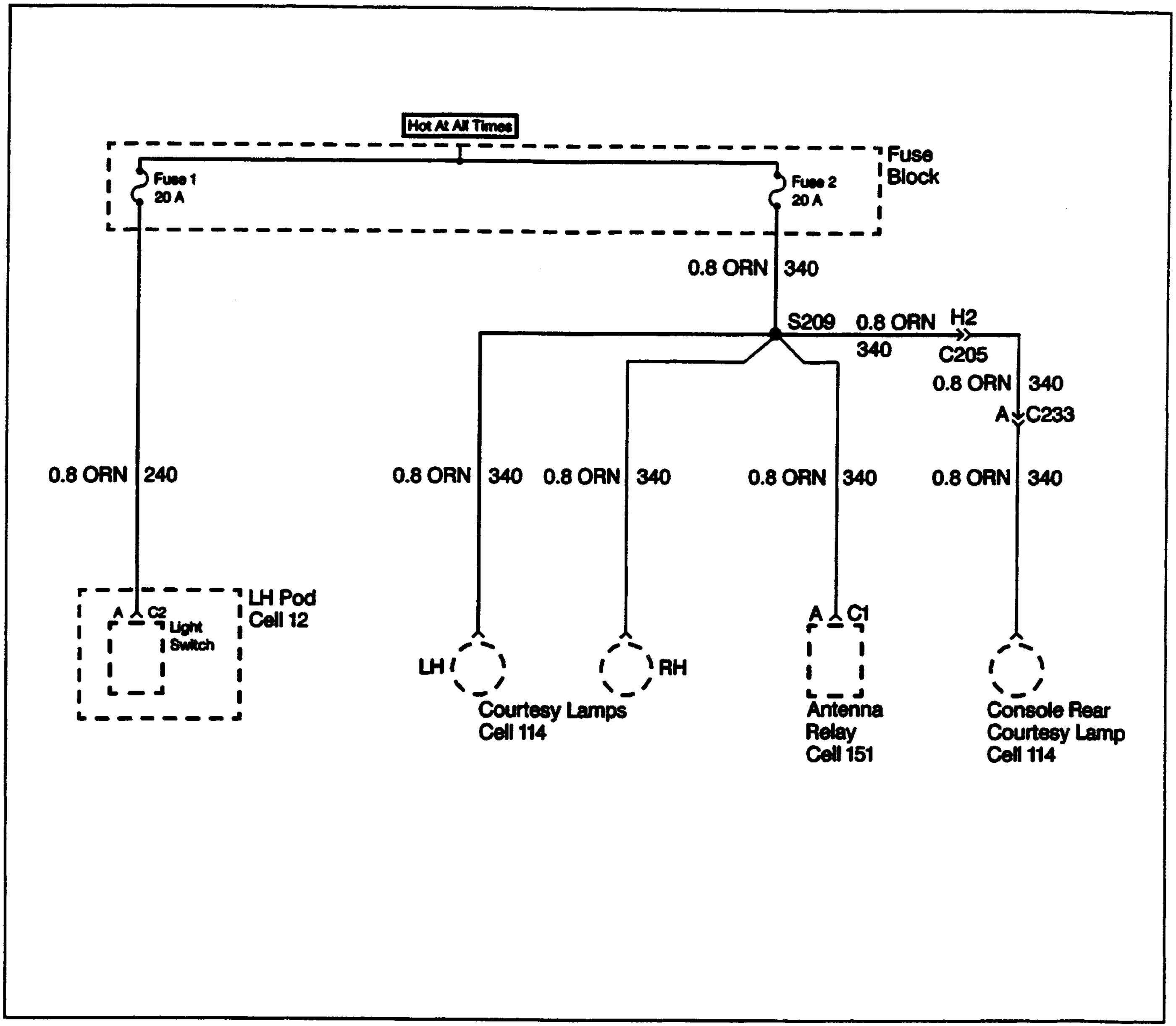

Hot At All Times
Fuse Block
Fuse 1
20 A
Fuse 2
20 A
0.8 ORN
340
S209
0.8 ORN
H2
340
C205
0.8 ORN
340
A
C233
0.8 ORN
240
0.8 ORN
340
0.8 ORN
340
0.8 ORN
340
0.8 ORN
340
A
C2
Light Switch
LH Pod
Cell 12
LH
RH
Courtesy Lamps
Cell 114
A
C1
Antenna
Relay
Cell 151
Console Rear
Courtesy Lamp
Cell 114

Figure 4—Typical Fuse Block Details Schematic

FUSE BLOCK DETAILS

The Fuse Block Details schematic (see Figure 4) shows all of the wiring between a fuse and the components connected to the fuse. The Fuse Block Details schematic is extremely helpful in locating a short circuit that causes a fuse to open.

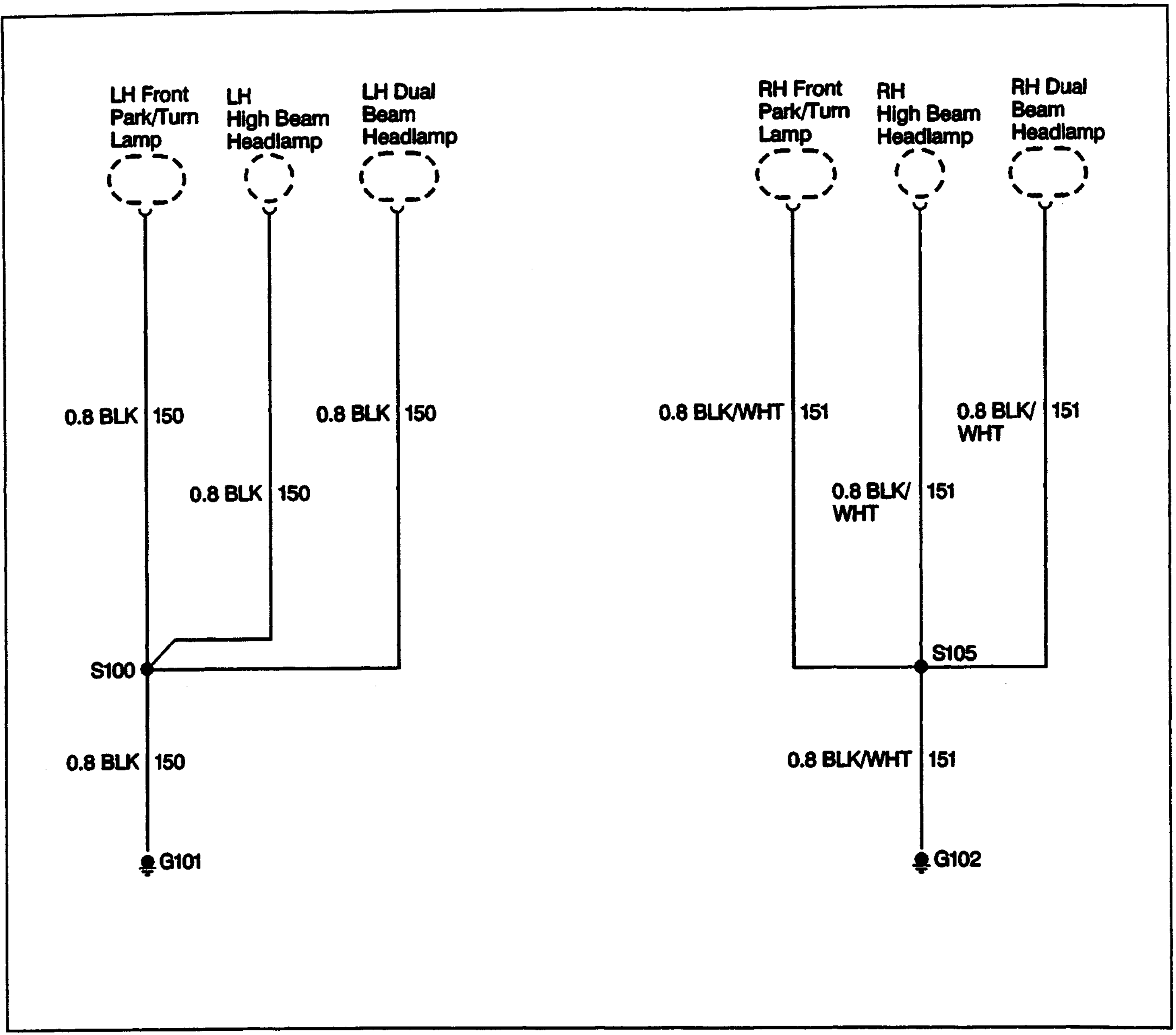

LH Front Park/Turn Lamp
LH High Beam Headlamp
LH Dual Beam Headlamp
RH Front Park/Turn Lamp
RH High Beam Headlamp
RH Dual Beam Headlamp
0.8 BLK 150
0.8 BLK 150
0.8 BLK 150
0.8 BLK/WHT 151
0.8 BLK/ WHT 151
0.8 BLK/ WHT 151
S100
S105
0.8 BLK 150
0.8 BLK/WHT 151
G101
G102

Figure 5—Typical Ground Distribution Schematic

GROUND DISTRIBUTION

Figure 5 is a sample Ground Distribution schematic for the Headlamps. It shows exactly which components share each ground. This information can often be a timesaver when troubleshooting ground circuits.

For example, if both Headlamps and the Park/Turn Lamp on one side are out, suspect an open in their common ground wire or the ground connection itself. On the other hand, if one of the lamps work, the ground and the wire up to the splice are good. You have learned this just by inspecting the schematic and knowing the vehicle's symptoms. No actual work on the lighting system was needed.

SYMBOLS

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are Solid State and the following information applies to them.

The ESD symbol (Figure 1) is used on schematics (Figure 2) to indicate which components are ESD sensitive. When handling any electronic part, the service technician should follow the guidelines below to reduce any possible electrostatic charge build-up on the service technician's body and inadvertent discharge to the electronic part. If it is not known whether or not a component is ESD sensitive, assume it is susceptible.

HANDLING PROCEDURES

1. Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position or walking a distance.
2. Avoid touching electrical terminals of the part, unless so instructed by a written diagnostic procedure.
3. When using a voltmeter, be sure to connect the ground lead first.
4. Do not remove a part from its protective package until it is time to install the part.
5. Before removing the part from its package, ground the package to a known good ground on the vehicle.

MEASURING PROCEDURES

The circuits shown within the boxes are greatly simplified. Do not troubleshoot by measuring resistance at any terminal of these devices unless so instructed by a written diagnostic procedure. Due to the simplification of the schematics, resistance measurements could be misleading, or could lead to electrostatic discharge.

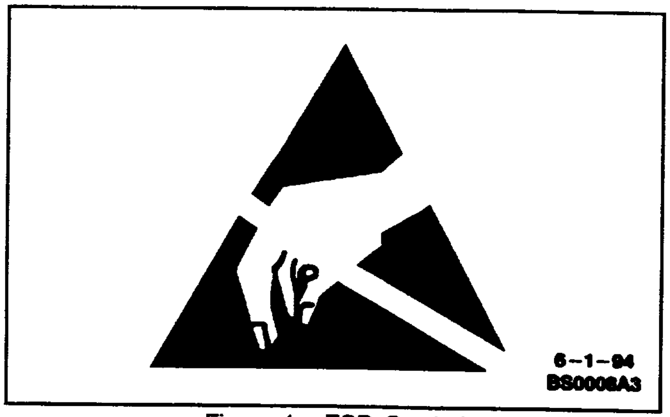


Figure 1 - ESD Symbol

SUPPLEMENTAL INFLATABLE RESTRAINT (SIR) SYSTEM

The SIR symbol (Figure 3) is used on schematics to alert the technician to the following important caution:

CAUTION: This vehicle is equipped with Supplemental Inflatable Restraint (SIR). Refer to CAUTIONS in SECTION 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location view in SECTION 9J before performing service on or around SIR components or wiring. Failure to follow CAUTIONS could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

ON-BOARD DIAGNOSTICS II (OBD II) SYMBOL

The OBD II symbol (Figure 4) is used on circuit diagrams to alert the technician that the circuit is essential for proper OBD II emission control circuit operation. Any circuit which, if it fails, causes the SERVICE ENGINE SOON indicator to turn on, is identified as an OBD II circuit. Refer to page 8A-5-12 for OBD II Circuit Service procedures.

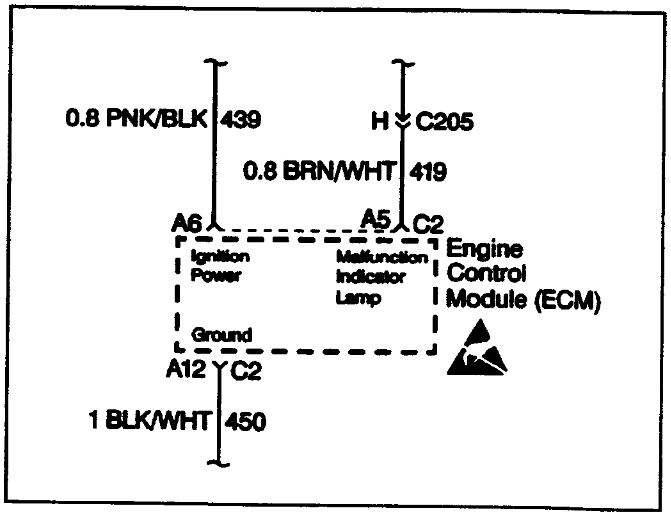


Figure 2 - Typical Schematic

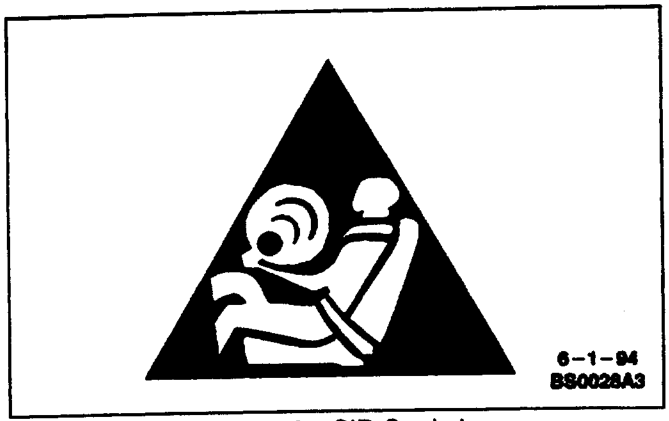

6-1-94
BS0028A3

Figure 3 - SIR Symbol

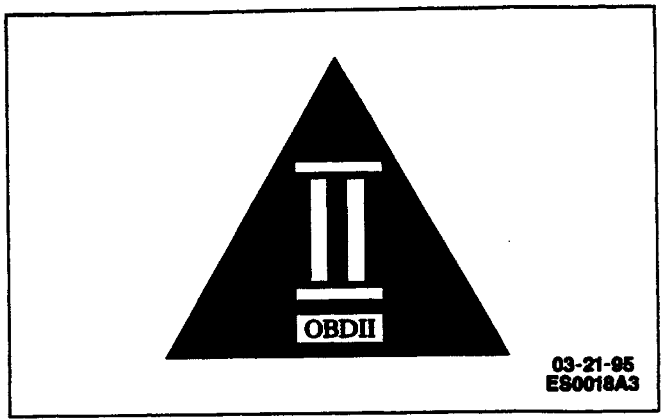
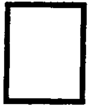
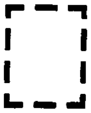

OBDII
03-21-95
ES0018A3

Figure 4 - OBD II Symbol

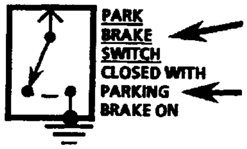
SYMBOLS



ENTIRE COMPONENT SHOWN

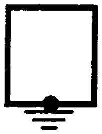


PART OF A COMPONENT SHOWN

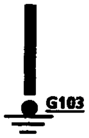

PARK BRAKE SWITCH
CLOSED WITH PARKING BRAKE ON

NAME OF COMPONENT

DETAILS ABOUT COMPONENT OR ITS OPERATION

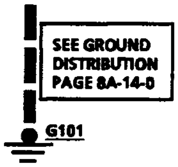


COMPONENT CASE IS DIRECTLY ATTACHED TO METAL PART OF VEHICLE (GROUNDED).



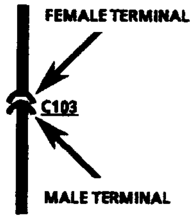
WIRE IS ATTACHED TO METAL PART OF VEHICLE (GROUNDED).

GROUND IS NUMBERED FOR REFERENCE ON COMPONENT LOCATION LIST.


SEE GROUND DISTRIBUTION PAGE 8A-14-0
G101

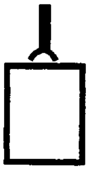
WIRE IS INDIRECTLY CONNECTED TO GROUND.

WIRE MAY HAVE ONE OR MORE SPLICES OR CONNECTORS BEFORE IT IS GROUNDED.

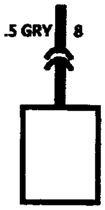

FEMALE TERMINAL
C103
MALE TERMINAL

CONNECTOR REFERENCE NUMBER FOR COMPONENT LOCATION LIST

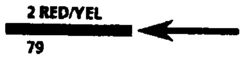
LIST ALSO SHOWS TOTAL NUMBER OF TERMINALS POSSIBLE. C103 (6 CAVITIES)



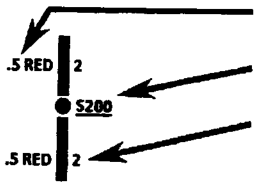
CONNECTOR ATTACHED TO COMPONENT



CONNECTOR ON COMPONENT LEAD (PIGTAIL)



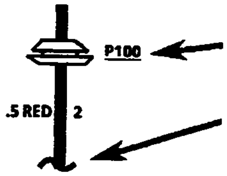
WIRE INSULATION IS RED WITH A YELLOW STRIPE.


.5 RED
2
S200
.5 RED
2

WIRE GAGE AND INSULATION COLOR ARE LABELED.

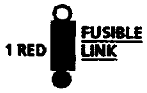
SPLICES ARE SHOWN AND NUMBERED.

CIRCUIT NUMBER IS SHOWN TO HELP IN TRACING CIRCUITS.

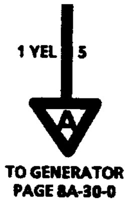


PASS THROUGH GROMMET, NUMBERED FOR REFERENCE.

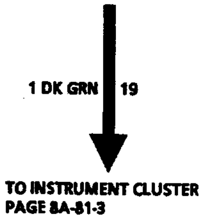
A WAVY LINE MEANS A WIRE IS TO BE CONTINUED.


1 RED
FUSIBLE LINK

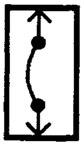
FUSIBLE LINK SIZE AND INSULATION COLOR ARE LABELED.


1 YEL
5
A
TO GENERATOR PAGE 8A-30-0

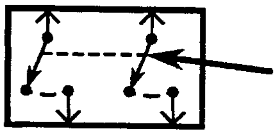
CURRENT PATH IS CONTINUED AS LABELED. THE ARROW SHOWS THE DIRECTION OF CURRENT FLOW AND IS REPEATED WHERE CURRENT PATH CONTINUES.


1 DK GRN
19
TO INSTRUMENT CLUSTER PAGE 8A-81-3

A WIRE WHICH CONNECTS TO ANOTHER CIRCUIT. THE WIRE IS SHOWN AGAIN ON THAT CIRCUIT.

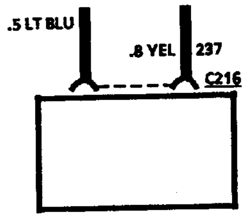


CIRCUIT BREAKER



SWITCH CONTACTS THAT MOVE TOGETHER

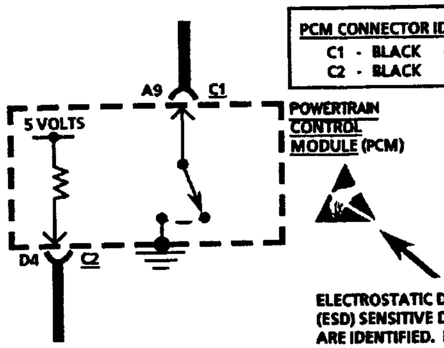
DASHED LINE SHOWS A MECHANICAL CONNECTION BETWEEN SWITCH CONTACTS.


.5 LT BLU
.8 YEL
237
C216

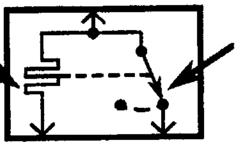
TWO TERMINALS IN THE SAME CONNECTOR

DASHED LINE SHOWS A PHYSICAL CONNECTION BETWEEN PARTS (SAME CONNECTOR).

PCM CONNECTOR IDENTIFICATION		
C1	BLACK	32 WAY
C2	BLACK	24 WAY

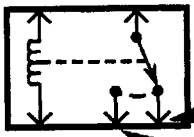

A9
C1
5 VOLTS
POWERTRAIN CONTROL MODULE (PCM)
D4
C2

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES ARE IDENTIFIED. REFER TO PAGE 8A-3-0 FOR HANDLING AND MEASURING PROCEDURES.



HEATING ELEMENT

HEAT-ACTUATED CONTACT

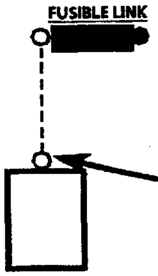


UNLESS NOTED, THE RELAY WILL BE SHOWN IN A DE-ENERGIZED STATE WITH NO CURRENT FLOWING THROUGH THE COIL.

NORMALLY CLOSED CONTACT

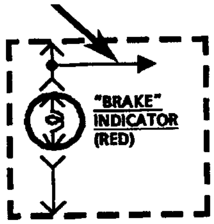
WHEN CURRENT FLOWS THROUGH COIL, CONTACT WILL TOGGLE.

NORMALLY OPEN CONTACT

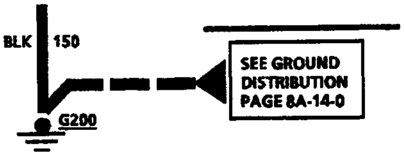

FUSIBLE LINK

FUSIBLE LINK CONNECTS TO SCREW TERMINAL. SHOWN SEPARATED

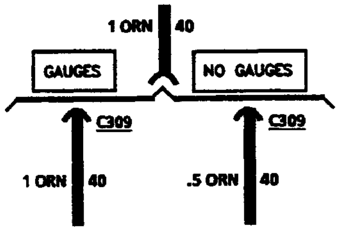
INDICATES THIS CIRCUIT CONTINUES WITHIN DEVICE; I.E., OTHER BULBS


"BRAKE" INDICATOR (RED)

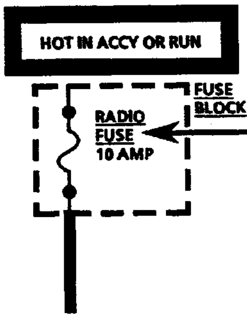
AN INDICATOR WHICH DISPLAYS THE LIGHTED WORD "BRAKE"


3 BLK
150
G200
SEE GROUND DISTRIBUTION PAGE 8A-14-0

INDICATES THAT THE CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL BUT IS COMPLETE ON THE INDICATED PAGE

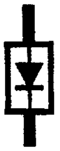

1 ORN
40
GAUGES
NO GAUGES
C309
C309
1 ORN
40
.5 ORN
40

WIRE CHOICES FOR OPTIONS OR DIFFERENT MODELS ARE SHOWN AND LABELED.

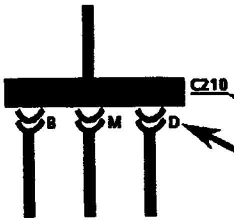

HOT IN ACCY OR RUN
FUSE BLOCK
RADIO FUSE
10 AMP

INDICATES THAT POWER IS SUPPLIED WITH IGNITION SWITCH IN "ACCY" AND "RUN" POSITIONS

LABEL OF FUSE BLOCK CONNECTOR CAVITY



DIODE ALLOWS CURRENT TO FLOW IN ONE DIRECTION ONLY

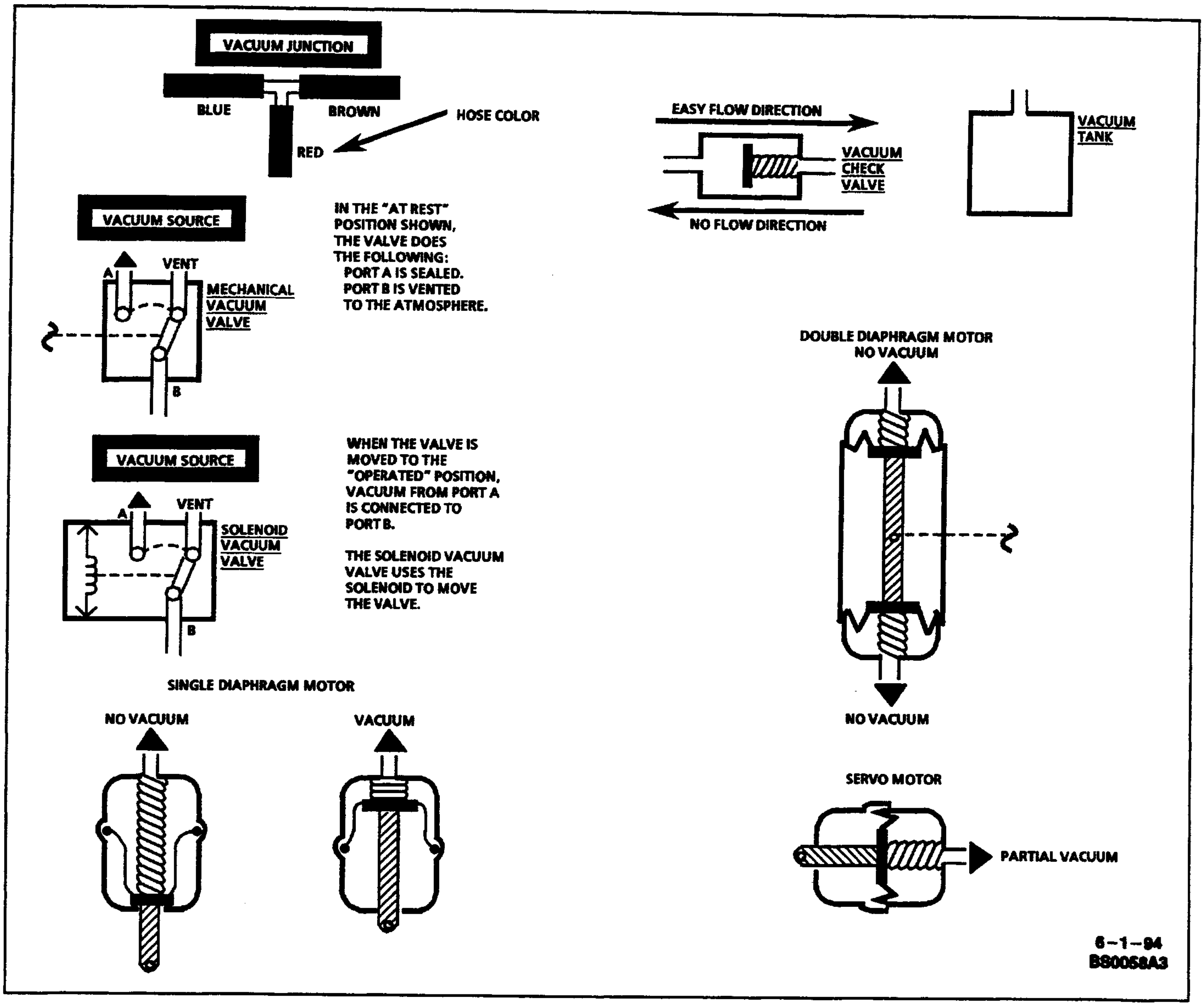


3 CONNECTORS ARE SHOWN CONNECTED TOGETHER AT A JUNCTION BLOCK. FOURTH WIRE IS SOLDERED TO COMMON CONNECTION ON BLOCK.

NUMBER FOR TOTAL CONNECTOR

LETTERS FOR EACH CONNECTOR TERMINAL

12-10-96
BS0048A3


VACUUM JUNCTION
BLUE
BROWN
HOSE COLOR
RED
EASY FLOW DIRECTION
VACUUM CHECK VALVE
NO FLOW DIRECTION
VACUUM TANK
VACUUM SOURCE
A
VENT
MECHANICAL VACUUM VALVE
B
IN THE "AT REST" POSITION SHOWN, THE VALVE DOES THE FOLLOWING:
PORT A IS SEALED.
PORT B IS VENTED TO THE ATMOSPHERE.
DOUBLE DIAPHRAGM MOTOR
NO VACUUM
VACUUM SOURCE
A
VENT
SOLENOID VACUUM VALVE
B
WHEN THE VALVE IS MOVED TO THE "OPERATED" POSITION, VACUUM FROM PORT A IS CONNECTED TO PORT B.
THE SOLENOID VACUUM VALVE USES THE SOLENOID TO MOVE THE VALVE.
NO VACUUM
SINGLE DIAPHRAGM MOTOR
NO VACUUM
VACUUM
SERVO MOTOR
PARTIAL VACUUM
6-1-94
BS0058A3

VACUUM MOTORS AND DEVICES

Vacuum Motors operate like electrical solenoids, mechanically pushing or pulling a shaft between two fixed positions. When vacuum is applied, the shaft is pulled in. When no vacuum is applied, the shaft is pushed all the way out by a spring.

Double Diaphragm Motors can be operated by vacuum in two directions. When there is no vacuum, the motor is in the center "AT REST" position.

Some Vacuum Motors such as the Servo Motor in the Cruise Control can position the actuating arm at any position between fully extended and fully retracted. The servo is operated by a control valve that applies varying amounts of vacuum to the motor. The higher the vacuum level, the greater the retraction of the motor arm. Servo Motors work like the two position motors; the only difference is in the way the vacuum is applied. Servo Motors are generally larger and provide a calibrated control.

BLANK

TROUBLESHOOTING PROCEDURES

BASIC KNOWLEDGE REQUIRED

Without a basic knowledge of electricity, it will be difficult to use the diagnostic procedures contained in this section. You should understand the basic theory of electricity and know the meaning of voltage, current (amps) and resistance (ohms). You should understand what happens in a circuit with an open or a shorted wire. You should be able to read and understand a wiring diagram.

The following four-step troubleshooting procedure is recommended:

Step 1: Check the Problem

Perform a System Check to determine a symptom. Don't waste time fixing part of the problem! Do not begin disassembly or testing until you have narrowed down the possible causes.

Step 2: Read the Electrical Schematic

Study the schematic. Read the Circuit Operation text if you do not understand how the circuit should work. Check circuits that share wiring with the problem circuit. (Shared circuits are shown on Power Distribution, Ground Distribution, Fuse Block Details, and Light Switch Details pages.) Try to operate the shared circuits. If the shared circuits work, then the shared wiring is OK. The cause must be within the wiring used only by the problem circuit. If several circuits fail at the same time, chances are the power (fuse) or ground circuit is faulty.

Step 3: Find the Fault and Repair

- Narrow down the possible causes.
- Make the necessary measurements or checks as given in the System Diagnosis.
- Before replacing a component, check power, signal and ground wires at the component harness connector. If the checks and connections are OK, the most probable cause is component failure.

Step 4: Test the Repair

Repeat the System Check to verify that the fault has been corrected and that no other faults were induced during the repair.

Example:

A customer brings in a vehicle and says that the High beams do not work.

Step 1: Perform a System Check on the Headlamp Circuit

You may discover that both Low beams operate. In "High," you may notice that the High Beam Indicator comes on, but neither High beam operates.

Step 2: Read the Headlamps Electrical Schematic (Figure 1).

This is the step that will save time and labor. Remember, it is essential to understand how a circuit should work before trying to figure out why it doesn't.

After you understand how the circuit should operate, read the schematic again, this time keeping in mind what you have learned by operating the circuit.

Since both Low beams work, you know that the Headlamp Switch, the YEL wire, the Low contacts of the Headlamp Dimmer Switch, terminal "1E" of C100, the TAN wires, and grounds G105 and G109 are all good.

Furthermore, since you saw that the High Beam Indicator came on when the Headlamp Dimmer Switch was moved to "High," you know that the High contacts of the Headlamp Dimmer Switch and the LT GRN wire between the Headlamp Dimmer Switch and C100 are good.

At this point, you could test for voltage at the RH Headlamp with the Headlamp Dimmer Switch in "High." However, it is extremely unlikely that the High beam filaments have burned out in both headlamps, or that both headlamp connections are bad. The cause must be a bad connection at C100, or a break in the LT GRN wire between C100 and the RH Headlamp.

You have quickly narrowed the possible causes down to one specific area, and have done absolutely no work on the vehicle itself.

Step 3: Find the Fault and Repair it

Using the Component Location Table and the corresponding figure, you can quickly find C100 and the LT GRN wire, locate the exact trouble point and make the repair.

Step 4: Check the Repair by Performing a System Check on the Headlamps Circuit

This, of course, means making sure that both High beams, both Low beams, and the High Beam Indicator are all working.

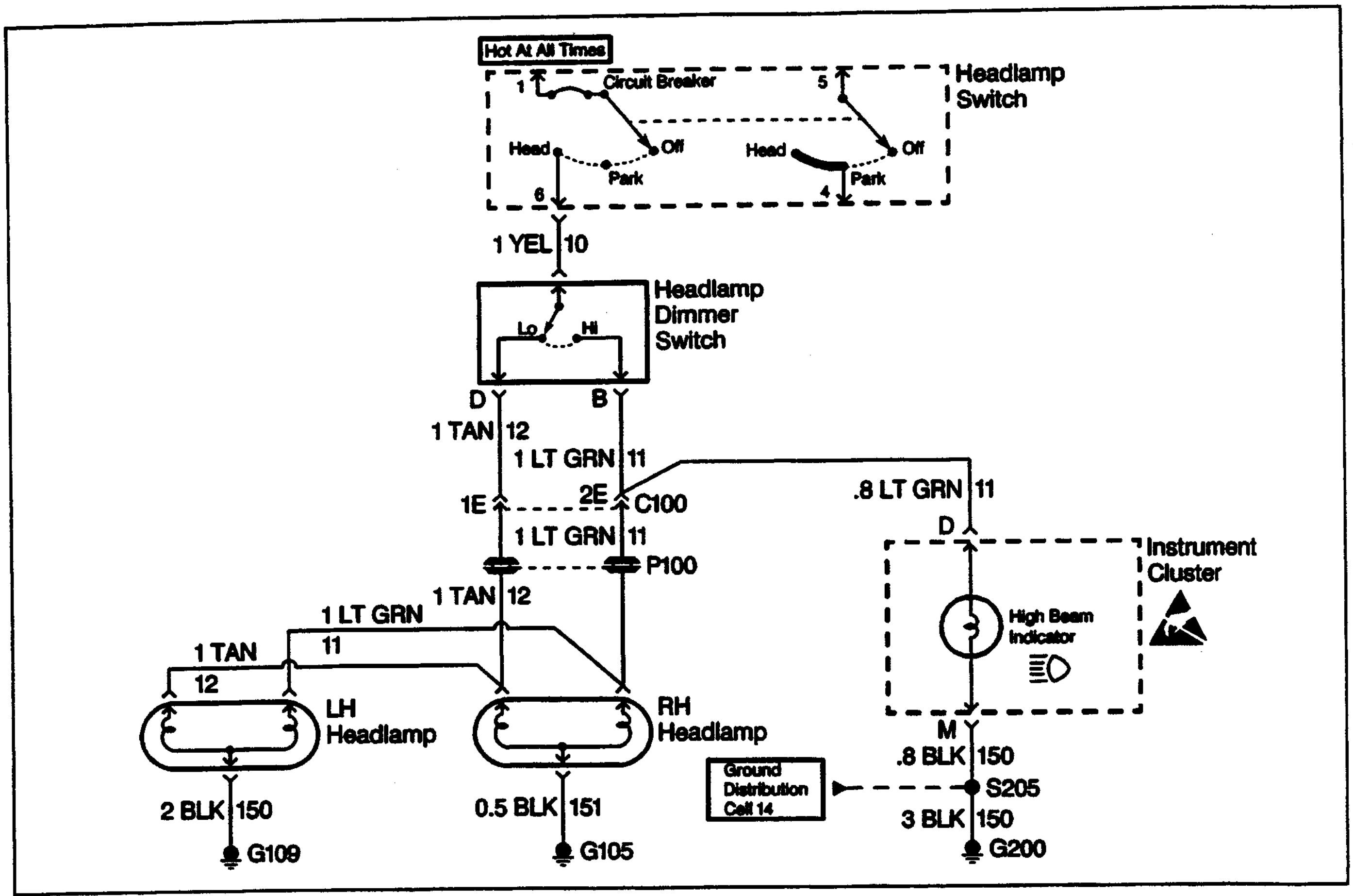

Hot At All Times
1
Circuit Breaker
5
Headlamp Switch
Head
Off
Park
Head
Off
Park
6
4
1 YEL 10
Headlamp Dimmer Switch
Lo
Hi
D
B
1 TAN 12
1 LT GRN 11
1E
2E
C100
.8 LT GRN 11
D
1 LT GRN 11
P100
Instrument Cluster
1 TAN 12
1 LT GRN
1 TAN
11
12
High Beam Indicator
LH Headlamp
RH Headlamp
M
.8 BLK 150
Ground Distribution Cell 14
S205
2 BLK 150
0.5 BLK 151
3 BLK 150
G109
G105
G200

Figure 1—Typical Headlamps Schematic

Now suppose that the symptoms were different. You may have operated the Headlamps and found that the Low beams were working, but neither the High beams nor the High Beam Indicator were working. Looking at the schematic, you might conclude that it is unlikely that both High beam filaments and the High Beam Indicator have all burned out at once. The cause is probably the Headlamp Dimmer Switch or its connector.

TROUBLESHOOTING TOOLS

Electrical troubleshooting requires the use of common electrical test equipment.

TEST LIGHT/DIGITAL MULTIMETER

Use a test light to check for voltage. A J 34142-B Test Light is made up of a 12 volt light bulb with a pair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. When the bulb goes on, there is voltage at the point being tested.

A Digital Multimeter (DMM) can be used instead of a test light. While a test light shows whether or not voltage is present, a DMM indicates how much voltage is present.

An increasing number of circuits include solid state control modules. One example is the Powertrain Control Module (PCM). Voltages in these circuits should be tested only with a 10-megohm or higher impedance DMM or J 39200 multimeter. Unless directed to within the diagnostics, never use a test light on circuits that contain solid state components, since damage to these components may result.

When testing for voltage or continuity at the connection, it is not necessary to separate the two halves of the connector. Unless testing a Weather Pack® or a Metri Pack® connector 150 series and below, always probe the connector from the back. Always check both sides of the connector. An accumulation of dirt and corrosion between contact surfaces is sometimes a cause of electrical problems. A terminal contact checking procedure can be found on page 8A-4-6.

CONNECTOR TEST ADAPTERS

Connector Test Adapter Kit (J 35616-A) is available for making tests and measurements at separated connectors. This kit contains an assortment of probes which mate with many of the types of terminals you will see. Avoid using paper clips and other substitutes since they can damage terminals and cause incorrect measurements.

TROUBLESHOOTING PROCEDURES

SELF-POWERED TEST LIGHT

A self-powered test light (J 21008-A) can be used to check for continuity. This tool is made up of a light bulb, battery and two leads. If the leads are touched together, the bulb will go on.

A self-powered test light is used only on an unpowered circuit. First remove the fuse which feeds the circuit you're working on. Select two specific points along the circuit through which there should be continuity. Connect one lead of the self-powered test light to each point. If there is continuity, the test light circuit will be completed and the bulb will go on.

Never use a self-powered test light on circuits that contain solid state components, since damage to these components may result.

OHMMETER

The ohmmeter function on a DMM can be used instead of a self-powered test light. An ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

Circuits which include any solid state control modules, such as the PCM, should be tested only with a 10-megohm or higher impedance J 39200 digital multimeter.

Before measuring resistance with a DMM, disconnect the vehicle's battery. This will prevent incorrect readings. DMMs apply such a small voltage to measure resistance that the presence of voltages can upset a resistance reading.

Diodes and solid state components in a circuit can cause an ohmmeter to give a false reading. To find out if a component is affecting a measurement, take a reading once, reverse the leads and take a second reading. If the readings differ, the solid state component is affecting the measurement.

FUSED JUMPER WIRE

A J 36169 fused jumper is available with small clamp connectors providing adaptation to most connectors without damage. This fused jumper wire is supplied with a 20 A fuse which may not be suitable for some circuits. Do not use a fuse with a higher rating than the fuse that protects the circuit being tested.

> **NOTICE:** A fused jumper may not protect solid state components from being damaged.

SHORT FINDER

J 8681 short finders are available to locate hidden shorts to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

TROUBLESHOOTING TESTS

AFTERMARKET ACCESSORIES

Do not connect aftermarket accessories into SIR circuits. All such circuits are indicated on circuit diagrams with the SIR symbol. Refer to Symbols, SECTION 8A-3.

Do not connect aftermarket accessories into OBD II circuits. All such circuits are indicated on circuit diagrams with the OBD II symbol. Refer to Symbols, SECTION 8A-3.

Always check for aftermarket accessories (non-OEM) as the first step in diagnosing electrical problems. If the vehicle is so equipped, disconnect the system to verify that these add-on accessories are not the cause of the problems.

Some possible causes of vehicle problems related to aftermarket accessories include:

1. Power feeds connected to points other than the Battery.
2. Antenna location.
3. Transceiver wiring located too close to vehicle electronic modules or wiring.
4. Poor shielding or poor connectors on antenna feed line.

Check for recent service bulletins detailing installation guidelines for aftermarket accessories.

PROBING

After probing, when reconnecting connectors or replacing terminals, always be sure to reinstall Connector Position Assurance (CPA) and Terminal Position Assurance (TPA).

Frontprobe

When frontprobing of connectors is required, always use a mating terminal adapter from Connector Test Adapter Kit (J 35616-A). The use of proper adapters will ensure that proper terminal contact integrity is maintained. For a terminal contact checking procedure, refer to page 8A-4-5.

Backprobe

Only backprobe connector terminals when specifically called for in diagnostic procedures. Since backprobing can be a source of damage to connector terminals, extra care must be taken to avoid deforming the terminal, either by forcing the test probe too far into the cavity or by using too large a test probe.

After backprobing any connector, always check for terminal damage. If terminal damage is suspected, check for proper terminal contact (refer to "Checking Terminal Contact," page 8A-4-5).

TESTING FOR VOLTAGE (Figure 2)

1. Connect one lead of a test light to a known good ground. When using a DMM, be sure the voltmeter's negative lead is connected to ground.
2. Connect the other lead of the test light or voltmeter to a selected test point (connector or terminal).
3. If the test light illuminates, there is voltage present. When using a DMM, note the voltage reading.

TESTING FOR CONTINUITY (Figure 3)

1. Remove the fuse to the circuit involved.
2. Connect one lead of a self-powered test light or ohmmeter to one end of the part of the circuit you wish to test.
3. Connect the other lead to the other end of the circuit.
4. If the self-powered test light glows, there is continuity. When using an ohmmeter, low or no resistance means good continuity.

TESTING FOR VOLTAGE DROP (Figure 4)

This test checks for voltage being lost along a wire, or through a connection or switch.

1. Connect the positive lead of a DMM to the end of the wire (or to one side of the connection or switch) which is closer to the Battery.
2. Connect the negative lead to the other end of the wire (or the other side of the connection or switch).
3. Operate the circuit.
4. The DMM will show the difference in voltage between the two points.

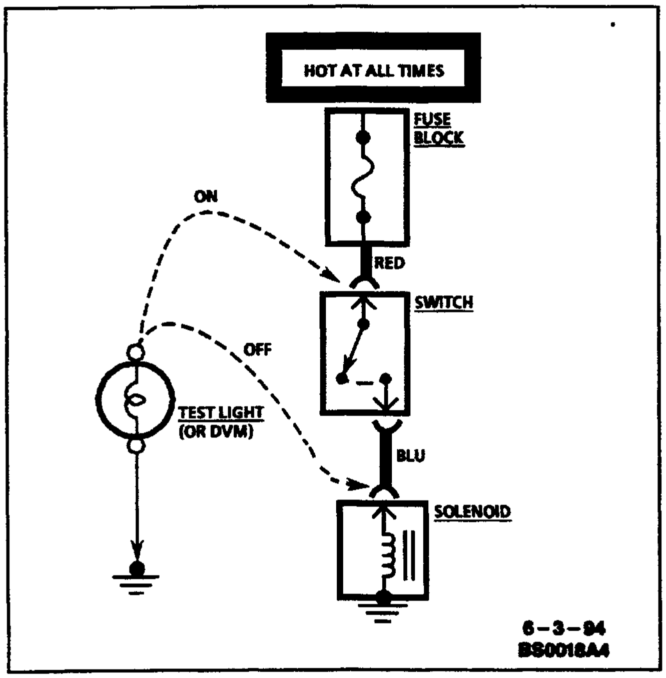

HOT AT ALL TIMES
FUSE BLOCK
ON
RED
SWITCH
OFF
TEST LIGHT (OR DVM)
BLU
SOLENOID
6-3-94
BS0018A4

Figure 2—Voltage Check

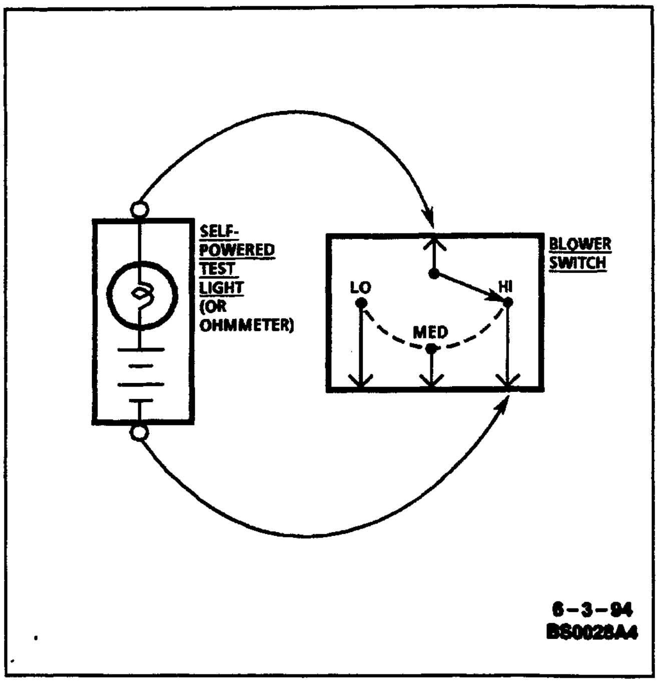

SELF-POWERED TEST LIGHT (OR OHMMETER)
BLOWER SWITCH
LO
HI
MED
6-3-94
BS0028A4

Figure 3—Continuity Check through a Switch

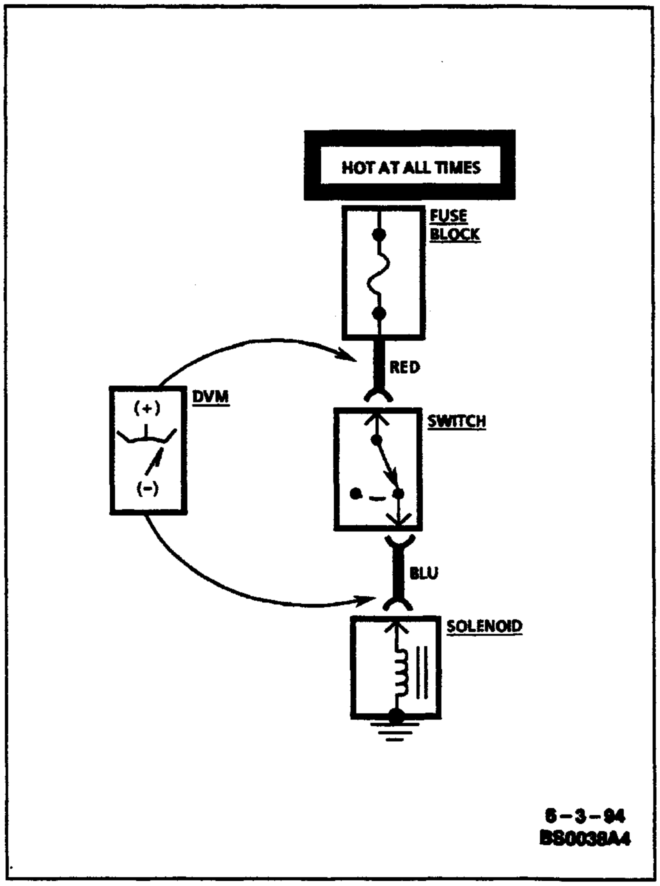

HOT AT ALL TIMES
FUSE BLOCK
RED
DVM
(+)
(-)
SWITCH
BLU
SOLENOID
6-3-94
BS0038A4

Figure 4—Voltage Drop Test

TROUBLESHOOTING PROCEDURES

TESTING FOR SHORT TO GROUND

With a Test Light or DMM (Figure 5)

1. Remove the blown fuse and disconnect the load.
2. Connect a test light or voltmeter across the fuse terminals (be sure that the fuse is powered).
3. Beginning near the Fuse Block, wiggle the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the test light or DMM.
4. When the test light glows, or the DMM registers, there is a short to ground in the wiring near that point.

With a Self-Powered Test Light or Ohmmeter (Figure 6)

1. Remove the blown fuse and disconnect the Battery and load.
2. Connect one lead of a self-powered test light or ohmmeter to the fuse terminal on the load side.
3. Connect the other lead to a known good ground.
4. Beginning near the Fuse Block, wiggle the harness from side to side. Continue this at convenient points (about 6 inches apart) while watching the self-powered test light or ohmmeter.
5. When the self-powered test light glows, or the ohmmeter registers, there is a short to ground in the wiring near that point.

Fuses Powering Several Loads

1. Find the schematic in "Fuse Block Details," page 8A-11-0, for the fuse that has blown.
2. Open the first connector or switch leading from the fuse to each load.
3. Replace the fuse.
   - If the fuse blows, the short is in the wiring leading to the first connector or switch. Use a test light or DMM as described on previous page.
   - If fuse does not blow, refer to next step.
4. Close each connector or switch until the fuse blows in order to find which circuit has the short. Connect test light or DMM at the connector to the suspect circuit (disconnected) rather than at the fuse terminals.

INTERMITTENT AND POOR CONNECTIONS

Most intermittents are caused by faulty electrical connections or wiring, although occasionally a sticking relay or solenoid can be a problem. Some items to check are:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.

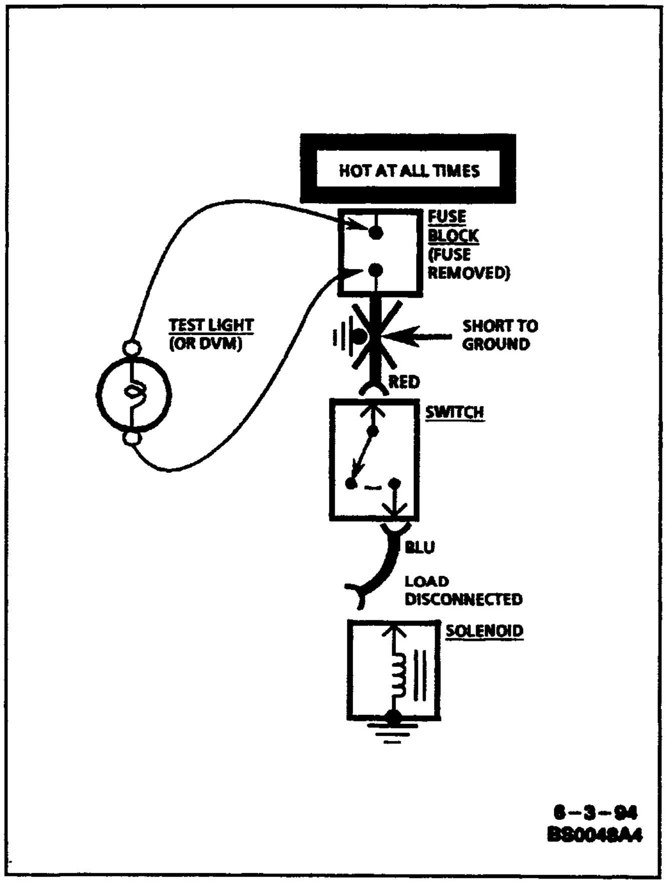

HOT AT ALL TIMES
FUSE BLOCK (FUSE REMOVED)
TEST LIGHT (OR DVM)
SHORT TO GROUND
RED
SWITCH
BLU
LOAD DISCONNECTED
SOLENOID
6-3-94
BS0048A4

Figure 5 - Testing for Short with Test Light or DMM

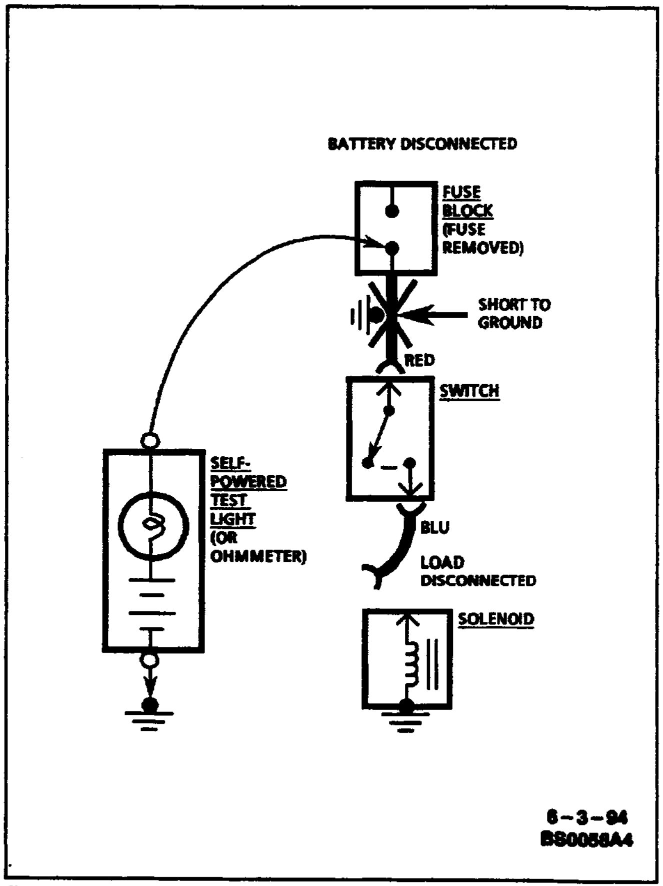

BATTERY DISCONNECTED
FUSE BLOCK (FUSE REMOVED)
SHORT TO GROUND
RED
SWITCH
SELF-POWERED TEST LIGHT (OR OHMMETER)
BLU
LOAD DISCONNECTED
SOLENOID
6-3-94
BS0058A4

Figure 6 - Testing for Short with Self-Powered Test Light or Digital Multimeter

- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals. All connector terminals in problem circuits should be checked carefully to ensure good contact tension. Use a corresponding mating terminal to check for proper tension. Refer to "Checking Terminal Contact" in this section for the specific procedure.
- The J 35616-A Connector Test Adapter Kit must be used whenever a diagnostic procedure requests checking or probing a terminal. Using the adapter will ensure that no damage to the terminal will occur, as well as giving an idea of whether contact tension is sufficient. If contact tension seems incorrect, refer to "Checking Terminal Contact" in this section for specifics.
- Poor terminal to wire connection. Some conditions which fall under this description are poor crimps, poor solder joints, crimping over wire insulation rather than the wire itself, corrosion in the wire to terminal contact area, etc.
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only one or two strands of a multi-strand type wire are intact, resistance could be far too high.

To avoid any of the above problems when making wiring or terminal repairs, always follow the instructions for wiring and terminal repair outlined in Repair Procedures, SECTION 8A-5.

CHECKING TERMINAL CONTACT

When diagnosing an electrical system that utilizes Metri-Pack 150/280/480/630 series terminals, it is important to check terminal contact between a connector and component, or between in-line connectors, before replacing a suspect component. Refer to J 38125-A Terminal Repair Kit or J 38125-4 Instruction Manual for terminal identification.

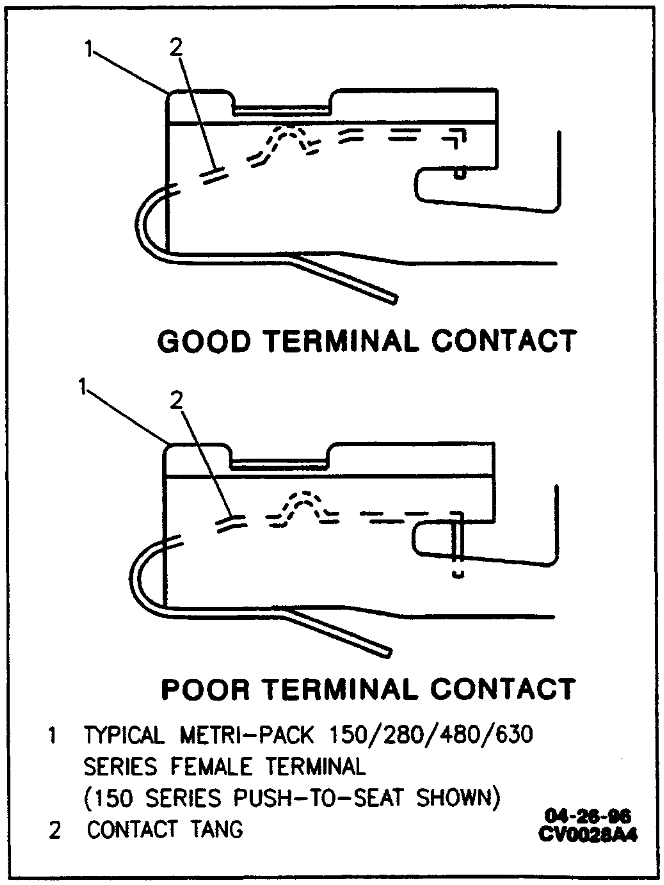
Frequently, diagnostics lead to a step that reads: "Check for poor connection." Mating terminals must be inspected to assure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination is caused by the connector halves being improperly connected, a missing or damaged connector seal, or damage to the connector itself, exposing the terminals to moisture and dirt. Contamination, usually in underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter, improperly joining the connector halves or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact (Refer to Figure 7), causing an open or intermittently open circuit.

Follow the procedure below to check terminal contact.

1. Separate the connector halves. Refer to J 38125-A Terminal Repair Kit or J 38125-4 Instruction Manual.
2. Inspect the connector halves for contamination. Contamination will result in a white or green build-up within the connector body or between terminals, causing high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.


1
2
GOOD TERMINAL CONTACT
1
2
POOR TERMINAL CONTACT
1 TYPICAL METRI-PACK 150/280/480/630 SERIES FEMALE TERMINAL (150 SERIES PUSH-TO-SEAT SHOWN)
2 CONTACT TANG
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CV0028A4

Figure 7 - Deformation of a Typical Metri-Pack 150/280/480/630 Series Female Terminal

TROUBLESHOOTING PROCEDURES

3. Using an equivalent male terminal from the J 38125-A Terminal Repair Kit, check the retention force of the female terminal in question by inserting and removing the male terminal to the female terminal in the connector body. Good terminal contact will require a certain amount of force to separate the terminals.
4. Using an equivalent female terminal from the J 38125-A Terminal Repair Kit, compare the retention force of this terminal to the female terminal in question by joining and separating the male terminal to the good female terminal, and then joining and separating the male terminal to the female terminal in question. If the retention force is significantly different between the two female terminals, replace the female terminal in question. Refer to J 38125-A Terminal Repair Kit.

If a visual (physical) check does not reveal the cause of the problem, the vehicle may be able to be driven with a DMM connected to the suspected circuit. An abnormal voltage reading when the problem occurs indicates the problem may be in that circuit.

DETECTING ELECTRICAL INTERMITTENTS

Use the following procedure to detect intermittent terminal contact or a broken wire with an intermittent connection inside the insulation.

The J 39200 Digital Multimeter (DMM) has the ability to monitor current, resistance, or voltage while recording the minimum (MIN) and maximum (MAX) values measured. The DMM can also be set to display the average (AVG) value measured.

When diagnosing circuits that have voltage applied, use the voltage setting to monitor a connector (or length of a circuit) which is suspected of having an intermittent connection but is currently operating normally.

1. Connect the J 39200 Digital Multimeter to both sides of a suspect connector (still connected) or from one end of a suspect circuit to the other. This will continuously monitor the terminal contacts or length of wire being checked. Refer to "Digital Multimeter (DMM) Connections" in this section for examples of the various methods for connecting the DMM to the circuit.
2. Set the DMM for voltage. Since the "MIN MAX" mode does not use auto ranging, manually select the voltage range necessary before proceeding.
3. Press the "MIN MAX" button. The DMM should read "100 ms RECORD" (100 millisecond record) and emit a 1/4 second beep. The DMM is now ready to record and will generate an audible tone for any change in voltage. At this point, you may wish to press the "PEAK MIN MAX" button, which will record any voltage variations that occur for at least 1 millisecond.
4. Try to simulate the condition that is potentially causing an intermittent connection, either by wiggling connections or wiring, test driving or performing other operations. If an open or resistance is created, a voltage will be present and the DMM will emit a tone for as long as the open or resistance exists. Any change in voltage will cause the DMM to emit a tone for no less than 1/4 second. (Listening for a tone while manipulating wiring is very helpful for narrowing down an intermittent connection.)

Use the MIN and MAX values when the DMM is out of sight or sound range, in noisy areas or for test driving when it may not be possible to monitor the DMM.

To check the MIN and MAX recorded voltages press "MIN MAX" once for MAX and twice for MIN. A variation between MIN and MAX recorded voltages (unless nearly 0 volts) suggests an intermittent open or that resistance exists and should be repaired as necessary. Refer to Repair Procedures, SECTION 8A-5 for approved circuit repair procedures.

[!] Important:

- The "100 ms RECORD" (100 millisecond record) mode is NOT the amount of time allowed to perform a specific procedure. It is the amount of time used to record each snapshot of information used for calculating "AVG" when in the "MIN MAX" mode.

DIGITAL MULTIMETER (DMM) CONNECTIONS

The previous diagnostic procedure was written to detect intermittents using the DMM set to voltage. Whether using the current, voltage, or resistance setting to detect intermittents, it is necessary to properly connect the DMM to the circuit.

Following are examples of the various methods of connecting the DMM to the circuit to be checked:

- Backprobe both ends of the connector and either hold the leads in place while manipulating the connector or tape the leads to the harness for continuous monitoring while performing other operations or test driving. (Do not backprobe "Weather Pack®" type connectors.)
- Disconnect the harness at both ends of the suspect circuit where it connects either to a component or to other harnesses.
- Use J 35616-A Connector Test Adapter Kit to connect the DMM to the circuit.
- If the system being diagnosed has a specified pinout or breakout box, it may be used to simplify connecting the DMM to the circuit or for checking multiple circuits quickly.

ADDITIONAL INFORMATION

NOTICE: Turn off power to the test circuit before attempting in-circuit resistance measurements to prevent false readings or damage to the DMM. Do not use the DMM to measure resistance through a solid state module.

Continuity tests that work well for detecting intermittent shorts to ground can be performed by setting the DMM to "ohms," then pressing the "PEAK MIN MAX" button. An audible tone will be heard whenever the DMM detects continuity for at least 1 millisecond.

The J 39200 Instruction Manual is a good source of information and should be read thoroughly upon receipt of the DMM as well as kept on hand for reference during new procedures.

REPAIR PROCEDURES

ELECTRICAL REPAIRS

This section provides instruction in the following repairs:

- Circuit protection.
- Typical electrical repairs.
- Splicing copper wire.
- Splicing twisted/shielded cable.
- Repairing connectors (except Weather Pack®).
- Repairing Weather Pack® (environmental) connectors.
- Terminal repair.
- Diode replacement.
- GMSPO service parts ordering.

After any electrical repair is made, always test the circuit by operating the devices in the circuit This confirms not only that the repair is correct but, also, that it was the cause of the complaint.

minimal amount of damage to the wiring assembly. However, it will not necessarily prevent damage to the component.

There are three basic types of circuit protection devices: circuit breakers, fuses and fusible links.

CIRCUIT BREAKERS

A circuit breaker is a protective device designed to open the circuit when a current load is in excess of rated breaker capacity. If there is a short or other type of overload condition in the circuit, the excessive current will open the circuit between the circuit breaker terminals. There are two basic types of circuit breakers used in GM vehicles: cycling and non cycling.

CYCLING CIRCUIT BREAKER

The cycling circuit breaker will open due to heat generated when excessive current passes through it for a period of time. Once the circuit breaker cools, it will close again after a few seconds. If the cause of the high current is still present it will open again. It will continue to cycle open and closed until the condition causing the high current is removed.

NON CYCLING CIRCUIT BREAKER

There are two types of non cycling circuit breakers. One type is mechanical and is nearly the same as a cycling circuit breaker. The difference is a small heater wire within the non cycling circuit breaker. This wire provides enough heat to keep the bimetallic element open until the current source is removed.

The other type is solid state, called out in this section as Electronic Circuit Breaker (ECB). This device has a positive temperature coefficient. It increases its resistance

CIRCUIT PROTECTION

The purpose of circuit protection is to protect the wiring assembly during normal and overload conditions. An overload is defined as a current requirement that is higher than normal. This overload could be caused by a short circuit or system malfunction. The short circuit could be the result of a pinched or cut wire or an internal device short circuit, such as an electronic module failure.

The circuit protection device is only applied to protect the wiring assembly, and not the electrical load at the end of the assembly. For example, if an electronic component short circuits, the circuit protection device will assure a greatly when excessive current passes through it. The excessive current heats the ECB. As it heats, its resistance increases, therefore having a positive temperature coefficient. Eventually the resistance gets so high that the circuit is effectively open. The ECB will not reset until the circuit is opened, removing voltage from its terminals. Once voltage is removed, the circuit breaker will reclose within a second or two.

FUSES

The most common method of automotive wiring circuit protection is the fuse (Figure 1). A fuse is a device that, by the melting of its element, opens an electrical circuit when the current exceeds a given level for a sufficient time. The action is non reversible and the fuse must be replaced each time a circuit is overloaded or after a malfunction is repaired.

Fuses are color coded. The standardized color identification and ratings are shown in Figure 2. For service replacement, non color-coded fuses of the same respective current rating can be used.

Examine a suspect fuse for a break in the element. If the element is broken or melted, replace the fuse with one of equal current rating.

There are additional specific circuits with in-line fuses. These fuses are located within the individual wiring harness and will appear to be an open circuit if blown.

AUTOFUSE

The Autofuse, normally referred to simply as "Fuse," is the most common circuit protection device in today's vehicle. The Autofuse is most often used to protect the wiring assembly between the fuse block and the system components.

MAXIFUSE®

The MaxiFuse® was designed to replace the fusible link and Pacific Fuse elements. The MaxiFuse® is designed to protect cables, normally between the battery and fuse block, from both direct short circuits and resistive short circuits.

Compared to a fusible link or a Pacific Fuse element, the MaxiFuse® performs much more like an Autofuse, although the average opening time is slightly longer. This is because the MaxiFuse® was designed to be a slower blowing fuse, with less chance of nuisance blows.

MINIFUSE®

The MiniFuse® is a smaller version of the Autofuse and has a similar performance. As with the Autofuse, the MiniFuse® is usually used to protect the wiring assembly between a fuse block and system components.

PACIFIC FUSE ELEMENT

The Pacific Fuse Element was developed to be a replacement for the fusible link. Like a fusible link, the fuses are designed to protect wiring from a direct short to ground. These elements are easier to service and inspect than a fusible link.

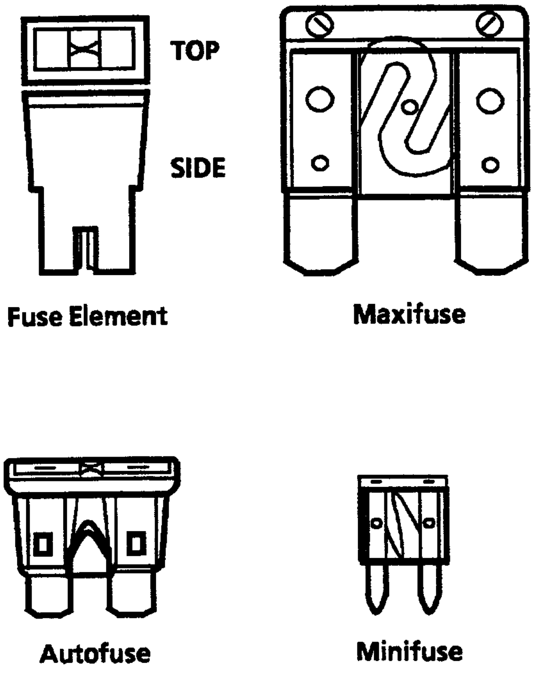

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Figure 1 - Fuse Devices

AUTOFUSE

CURRENT RATING	COLOR
3	VIOLET
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

MAXIFUSE

CURRENT RATING	COLOR
20	YELLOW
30	GREEN
40	AMBER
50	RED
60	BLUE
70	BROWN
80	NATURAL

MINIFUSE

CURRENT RATING	COLOR
2	GRAY
5	TAN
7.5	BROWN
10	RED
15	BLUE
20	YELLOW
25	NATURAL
30	GREEN

PACIFIC FUSE ELEMENT

CURRENT RATING	COLOR
30	PINK
40	GREEN
50	RED
60	YELLOW

12-10-96
BS0018A5

Figure 2 - Fuse Rating and Color

REPAIR PROCEDURES

FUSIBLE LINKS

In addition to circuit breakers and fuses, some circuits use fusible links to protect the wiring. Like fuses, fusible links are "one-time" protection devices that will melt and create an open circuit (refer to Figure 3).

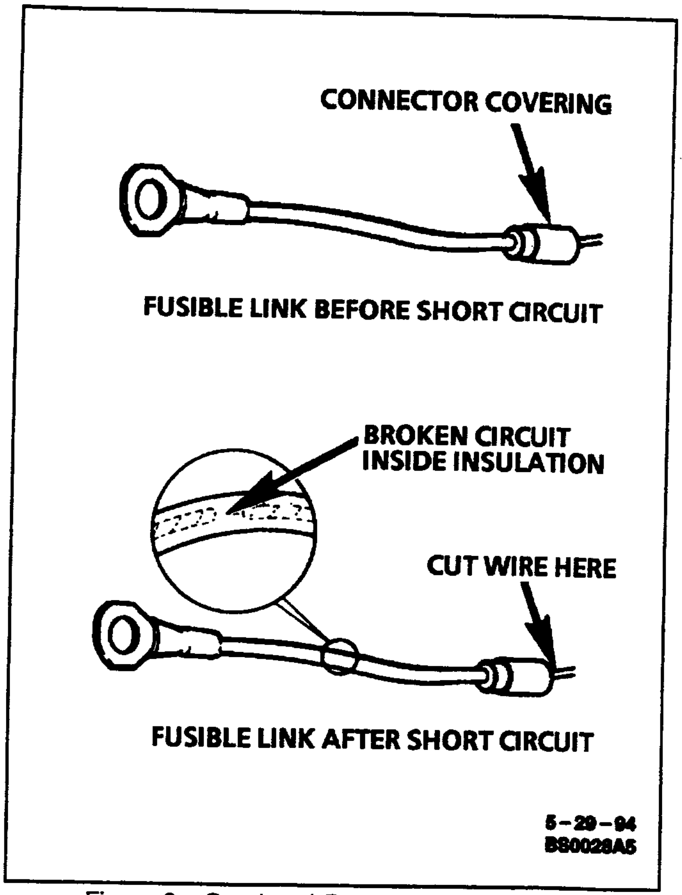

CONNECTOR COVERING
FUSIBLE LINK BEFORE SHORT CIRCUIT
BROKEN CIRCUIT INSIDE INSULATION
CUT WIRE HERE
FUSIBLE LINK AFTER SHORT CIRCUIT
5-29-94
BS0028A5

Figure 3 - Good and Damaged Fusible Links

Not all fusible link open circuits can be detected by observation. Always inspect that there is battery voltage past the fusible link to verify continuity.

Fusible links are used instead of a fuse in wiring circuits that are not normally fused, such as the ignition circuit. For AWG sizes, each fusible link is four wire gauge sizes smaller than the wire it is designed to protect. For example: to protect a 10 gauge wire, use a 14 gauge link or for metric, to protect a 5 mm^2 wire, use a 2 mm^2 link (refer to Figure 6). Links are marked on the insulation with wire-gauge size because the heavy insulation makes the link appear to be a heavier gauge than it actually is. The same wire size fusible link must be used when replacing a blown fusible link.

Fusible links are available with three types of insulation: Hypalon®, Silicone/GXL (SIL/GXL) and Expanded Duty. All future vehicles that use fusible links will utilize the Expanded Duty type of fusible link. When servicing fusible links, all fusible links can be replaced with the Expanded Duty type. SIL/GXL fusible links can be used to replace either SIL/GXL or Hypalon® fusible links. Hypalon® fusible links can only be used to replace Hypalon® fusible links.

Determining characteristics of the types of fusible links are:

- Hypalon® (limited use): only available in 0.35 mm^2 or smaller and its insulation is one color all the way through.
- SIL/GXL (widely used): available in all sizes and has a white inner core under the outer color of insulation.
- Expanded Duty: available in all sizes, has an insulation that is one color all the way through and has three dots following the writing on the insulation.

Service fusible links are available in many lengths. Choose the shortest length that is suitable. If the fusible link is to be cut from a spool, it should be cut 150-225 mm (approx. 6-9 inches.) long. NEVER make a fusible link longer than 225 mm (approx. 9 inches.).

CAUTION: Fusible links cut longer than 225 mm (approx. 9 inches.) will not provide sufficient overload protection.

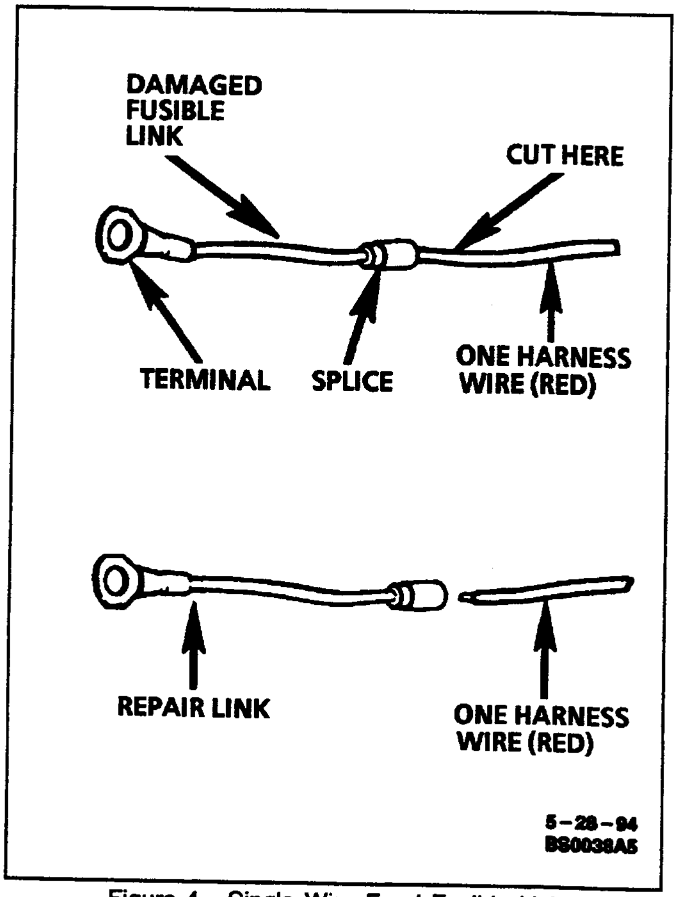


Figure 4 - Single Wire Feed Fusible Link

To replace a damaged fusible link (Figure 4), cut it off beyond the splice. Replace with a repair link. When connecting the repair link, strip wire and use staking-type pliers to crimp the splice securely in two places. For more details on splicing procedures, refer to "Splicing Copper

Wire using Splice Clips," "Splicing Copper Wire using Crimp and Seal Splice Sleeves," and "Splicing Twisted/Shielded Cable" later in this section.

To replace a damaged fusible link which feeds two harness wires, cut them both off beyond the splice. Use two repair links, one spliced to each harness wire (refer to Figure 5).

REPAIRING SHORT CIRCUITS CAUSED BY DAMAGED WIRE INSULATION

- Locate the damaged wire.
- Find and correct the cause of the wire insulation damage.
- For minor damage, tape over the wire. If damage is more extensive, replace the faulty segment of the wire (refer to the appropriate splicing instructions in this section for copper or shielded cable for the correct splicing procedure).

SPLICING COPPER WIRE USING SPLICE CLIPS

Splice clips are included in the J 38125-A Terminal Repair Kit. The splice clip is a general purpose wire repair device. It may not be acceptable for applications having special requirements such as moisture sealing. Refer to the appropriate Service Manual section to determine if there are any special requirements.

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). If the harness has a black plastic conduit, simply pull out the desired wire.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of the wire later if you decide to cut more wire off to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 40 mm (1.5 inches) away from other splices, harness branches, or connectors.

Step 3: Strip the Insulation

When replacing a wire, use a wire of the same size as the original wire or larger. The schematics list wire size in metric units. The following table (Figure 6) shows the commercial (AWG) wire sizes that can be used to replace each metric wire size. Each AWG size is either equal to or larger than the equivalent metric size.

To find the correct wire size either find the wire on the schematic page and convert the metric size to the AWG size, or use an AWG wire gauge.

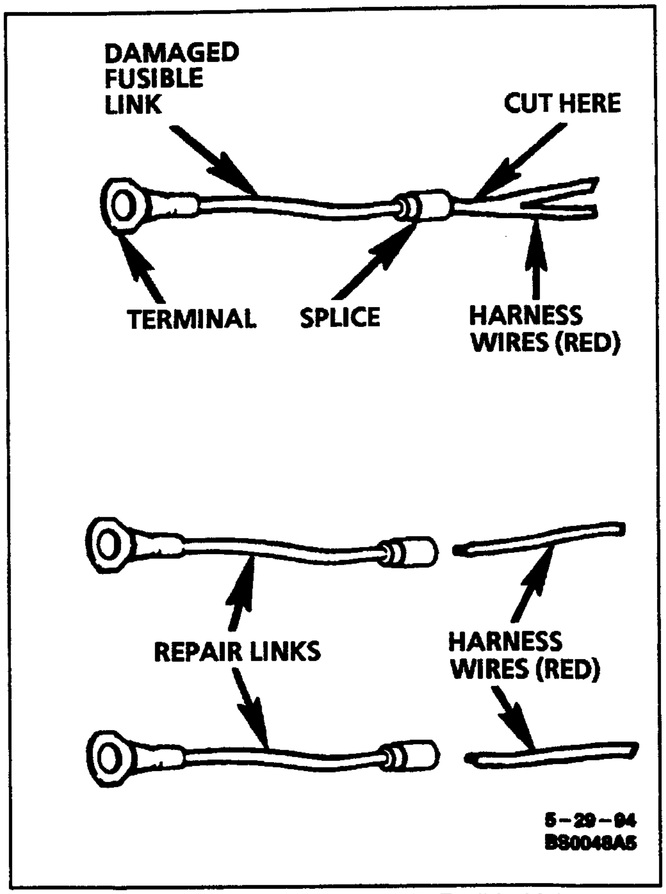


Figure 5 - Double Wire Feed Fusible Link

If you aren't sure of the wire size, start with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Be careful to avoid nicking or cutting any of the wires.

METRIC WIRE SIZES (mm^2)	AWG SIZES
0.22	24
0.35	22
0.5	20
0.8	18
1.0	16
2.0	14
3.0	12
5.0	10
8.0	8
13.0	6
19.0	4
32.0	2

Figure 6 - Wire Size Conversion Table

REPAIR PROCEDURES

Step 4: Crimp the Wires

Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, follow the directions included in the J 38125-A Terminal Repair Kit. Select the correct anvil on the crimper. (On most crimpers your choice is limited to either a small or large anvil.) Overlap the stripped wire ends and hold them between your thumb and forefinger as shown in Figure 7. Then, center the splice clip under the stripped wires and hold it in place.

- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the former touches the wings of the clip.
- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes (refer to Figure 8).
- Before crimping the ends of the clip, be sure that:
  - — The wires extend beyond the clip in each direction.
  - — No strands of wire are cut loose.
  - — No insulation is caught under the clip.

Crimp the splice again, once on each end. Do not let the crimping tool extend beyond the edge of the clip or you may damage or nick the wires (refer to Figure 9).

Step 5: Solder

Apply 60/40 rosin core solder to the opening in the back of the clip (refer to Figure 10). Follow the manufacturer's instructions for the solder equipment you are using.

Step 6: Tape the Splice

Center and roll the splicing tape. The tape should cover the entire splice. Roll on enough tape to duplicate the thickness of the insulation on the existing wires. Do not flag the tape. Flagged tape may not provide enough insulation, and the flagged ends will tangle with the other wires in the harness (refer to Figure 11).

If the wire does not belong in a conduit or other harness covering, tape the wire again. Use a winding motion to cover the first piece of tape (Figure 12).

SPLICING COPPER WIRE USING CRIMP AND SEAL SPLICE SLEEVES

Crimp and seal splice sleeves may be used on all types of insulation except Tefzel® and coaxial to form a one to one splice. They are to be used where there are special requirements such as moisture sealing. Refer to the appropriate section of the Service Manual to determine if the crimp and seal is necessary. Crimp and seal splice sleeves are included in the J 38125-A Terminal Repair Kit.

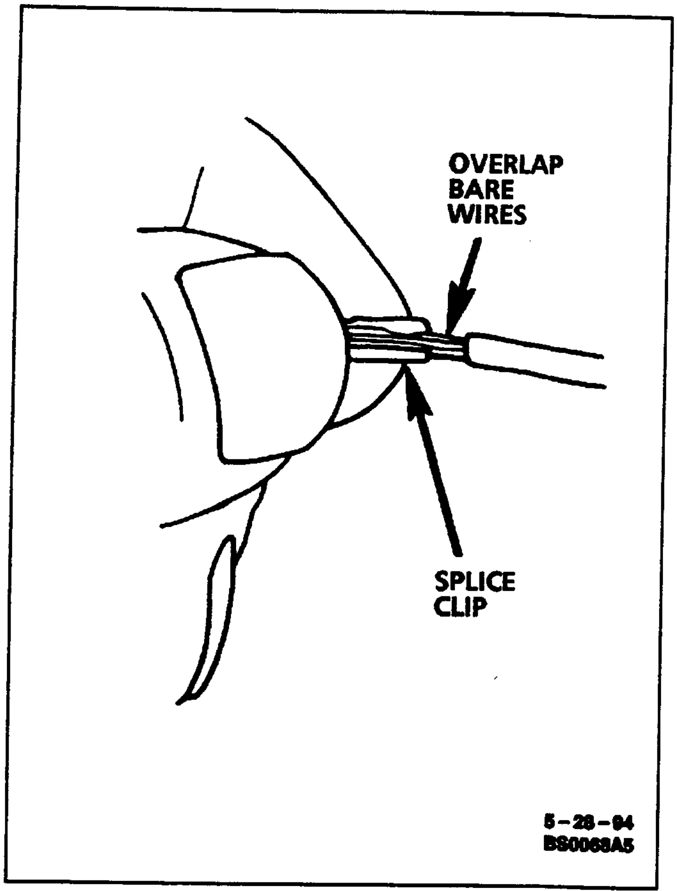


Figure 7 - Centering the Splice Clip

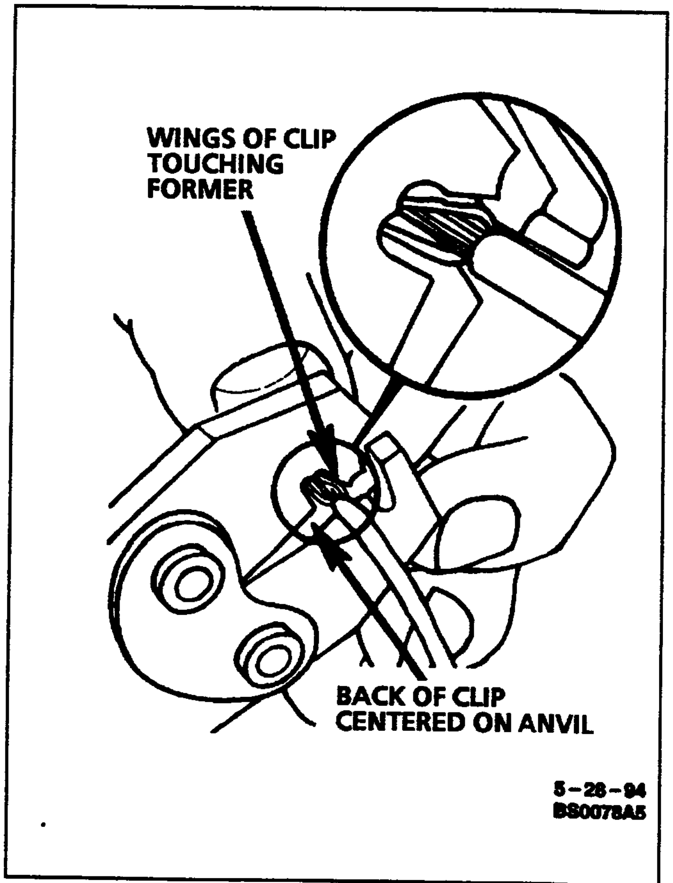


Figure 8 - Crimping the Splice Clip

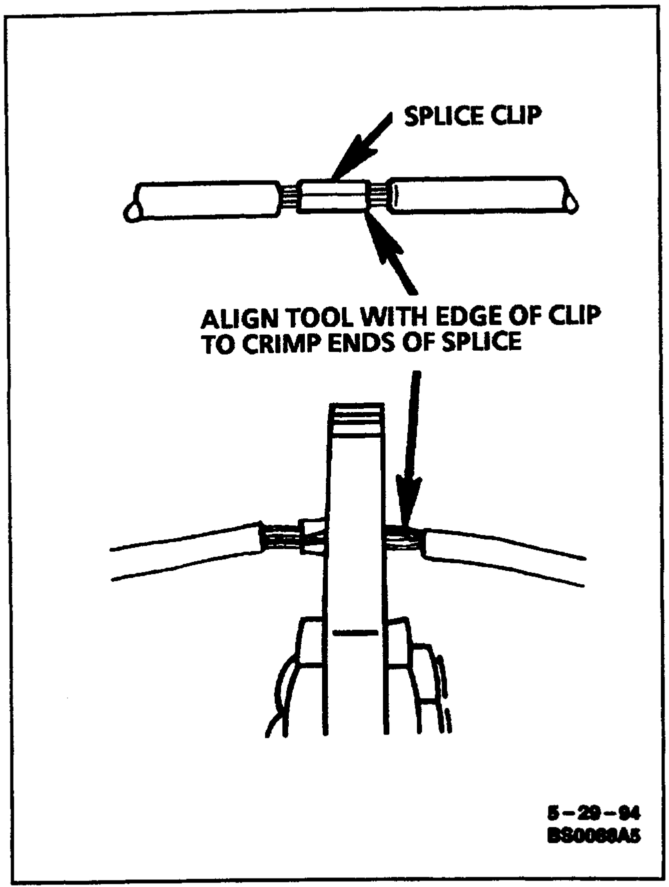

SPLICE CLIP
ALIGN TOOL WITH EDGE OF CLIP TO CRIMP ENDS OF SPLICE
5-29-94
BS0088A5

Figure 9 - Completing the Crimp

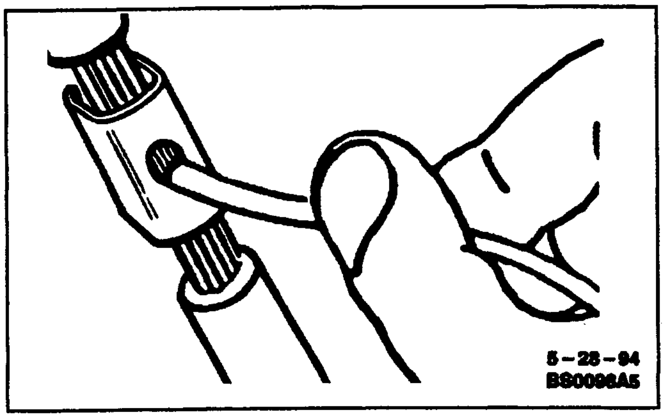

5-28-94
BS0098A5

Figure 10 - Applying the Solder

Step 1: Open the Harness

If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing "seam ripper" to cut open the harness (available from sewing supply stores). The crimp and seal splice sleeves may be used on all types of insulation except Tefzel® and coaxial and may only be used to form a one to one splice.

Step 2: Cut the Wire

Begin by cutting as little wire off the harness as possible. You may need the extra length of wire later if you decide to cut more wire to change the location of a splice.

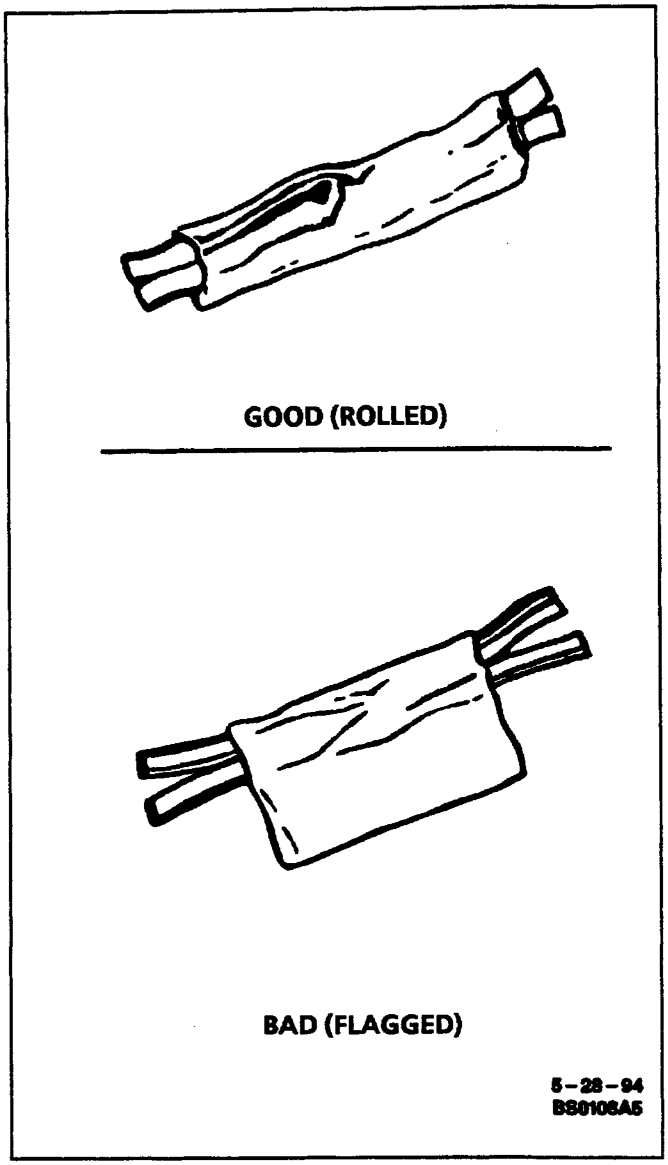

GOOD (ROLLED)
BAD (FLAGGED)
5-28-94
BS0108A5

Figure 11 - Proper First Taping

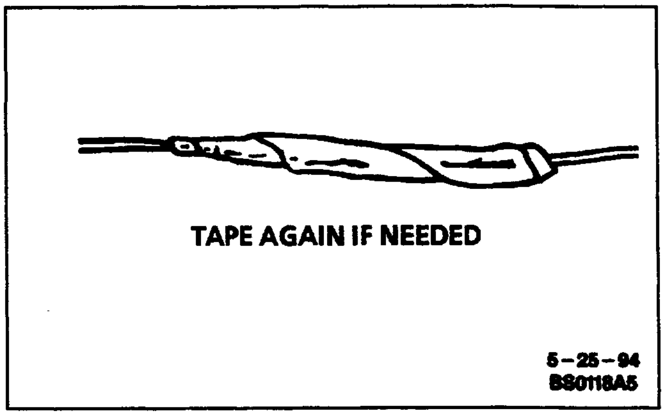

TAPE AGAIN IF NEEDED
5-25-94
BS0118A5

Figure 12 - Proper Second Taping

You may have to adjust splice locations to make certain that each splice is at least 40 mm (1.5 inches) away from other splices, harness branches or connectors. This will help prevent moisture from bridging adjacent splices and causing damage.

REPAIR PROCEDURES

Step 3: Strip the Insulation

If it is necessary to add a length of wire to the existing harness, be certain to use the same size as the original wire (refer to Figure 6, "Wire Size Conversion Table").

To find the correct wire size either find the wire on the schematic and convert the metric size to the equivalent AWG size or use an AWG wire gauge. If unsure about the wire size, begin with the largest opening in the wire stripper and work down until a clean strip of the insulation is removed. Strip approximately 7.5 mm (5/16 inch) of insulation from each wire to be spliced. Be careful to avoid nicking or cutting any of the wires. Check the stripped wire for nicks or cut strands. If the wire is damaged, repeat this procedure after removing the damaged section.

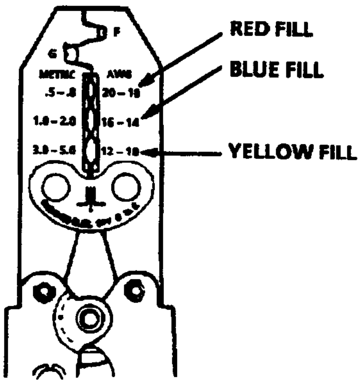
Step 4: Select and Position the Splice Sleeve

Select the proper splice sleeve according to wire size. The splice sleeves and tool nests are color-coded (refer to the Crimp and Seal Splice Sleeve Chart).

CRIMP AND SEAL SPLICE SLEEVE CHART

Color Splice Sleeve	Crimp Tool Nest Color	Wire Gauge AWG/(metric)
Salmon (yellowish-pink)	Red	20, 18/(0.5, 0.8)
Blue	Blue	16, 14/(1.0, 2.0)
Yellow	Yellow	12, 10/(3.0, 5.0)

Using the J 38125-8 Splice Crimp Tool (Figure 13), position the splice sleeve in the proper color nest of the hand crimp tool. Place the splice sleeve in the nest so that the crimp falls midway between the end of the barrel and the stop.



5-25-94
BS0128A5

Figure 13 - Hand Crimp Tool

The sleeve has a stop in the middle of the barrel to prevent the wire from going further (refer to Figure 14). Close the hand crimper handles slightly to hold the splice sleeve firmly in the proper nest.

Step 5: Insert Wires into Splice Sleeve and Crimp

Insert the wire into the splice sleeve until it hits the barrel stop and close the handles of the J 38125-8 Crimper tightly until the crimper handles open when released. The crimper handles will not open until the proper amount of pressure is applied to the splice sleeve. Repeat steps 4 and 5 for the opposite end of the splice.

Step 6: Shrink the Insulation Around the Splice

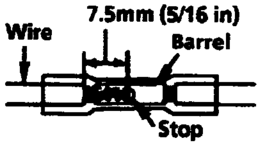
Using the J 38125-5 Ultratorch (follow instructions that accompany Ultratorch), apply heat where the barrel is crimped. Gradually move the heat barrel to the open end of the tubing, shrinking the tubing completely as the heat is moved along the insulation. A small amount of sealant will come out of the end of the tubing when sufficient shrinking is achieved (Figure 14).

SPLICING TWISTED/SHIELDED CABLE

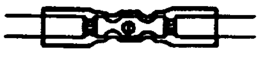
Twisted/shielded cable is sometimes used to protect wiring from electrical noise (stray signals). For example, the two-conductor cable of this construction is used between the ECM and the distributor. Refer to Figure 15 for a breakdown of twisted/shielded cable construction.

Step 1: Remove Outer Jacket

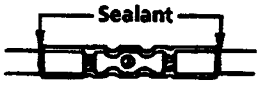
Remove the outer jacket and discard it. Be careful to avoid cutting into the drain wire or the mylar tape.



a. Splice before crimping



b. Splice after crimping



c. Splice after heating

5-28-94
BS0138A5

Figure 14 - Seal Splice Sequence

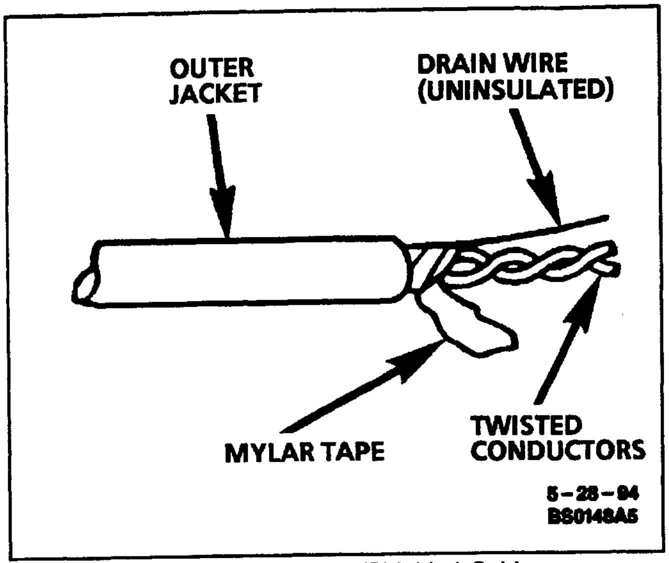


Figure 15 - Twisted/Shielded Cable

Step 2: Unwrap the Tape

Unwrap the mylar tape, but do not remove it. The tape will be used to rewrap the twisted conductors after the splices have been made.

Step 3: Prepare the Splice

Untwist the conductors. Then, prepare the splice by following the splicing instructions for copper wire presented earlier. Remember to stagger splices to avoid shorts (Figure 16).

Step 4: Reassemble the Cable

After you have spliced and taped each wire, rewrap the conductors with the mylar tape. Be careful to avoid wrapping the drain wire in the tape.

Next, splice the drain (ground) wire following the splicing instructions for copper wire. Then, wrap the drain wire around the conductors and mylar tape (Figure 17).

Step 5: Tape the Cable

Tape over the entire cable using a winding motion (refer to Figure 18). This tape will replace the section of the jacket you removed to make the repair.

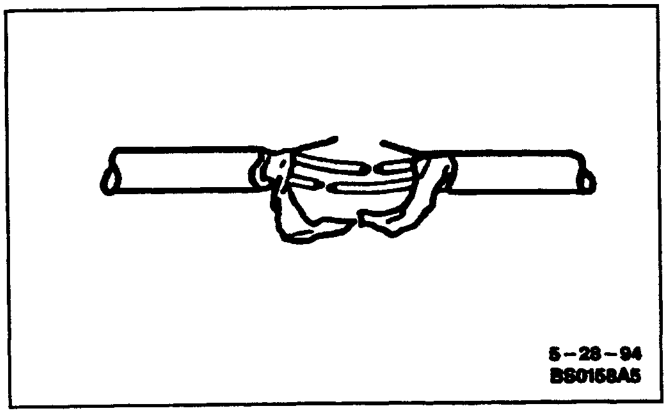


Figure 16 - The Untwisted Conductors

REPAIRING CONNECTORS

- The following general repair procedures can be used to repair most types of connectors. The repair procedures are divided into three general groups: Push to Seat, Pull to Seat and Weather Pack®.
- See "Connector End Views," page 8A-202-0, to determine which type of connector is to be serviced.
- Use the proper pick(s) or tool(s) that applies to the terminal.
- The J 38125-A Terminal Repair Kit contains further information.

PUSH TO SEAT AND PULL TO SEAT CONNECTOR REPAIR

Follow the steps below to repair Push to Seat (Figure 19) or Pull to Seat (Figure 20) connectors. The steps are illustrated with typical connectors. Your connector may differ, but the repair steps are similar. Some connectors do not require all the steps shown. Skip those that don't apply.

NOTICE: The Terminal Position Assurance (TPA) must be removed prior to terminal removal and must be replaced when the terminal is repaired and reseated.

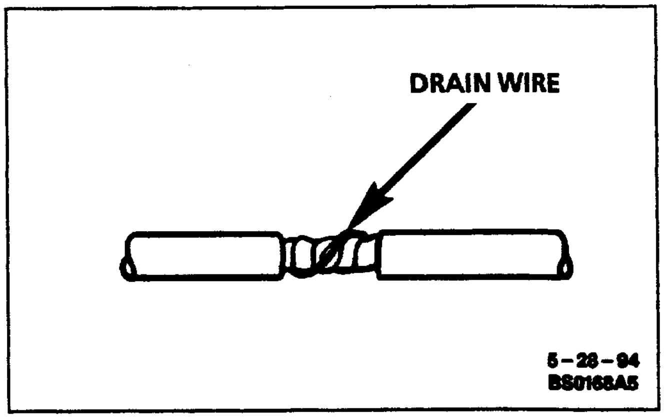


Figure 17 - The Reassembled Cable

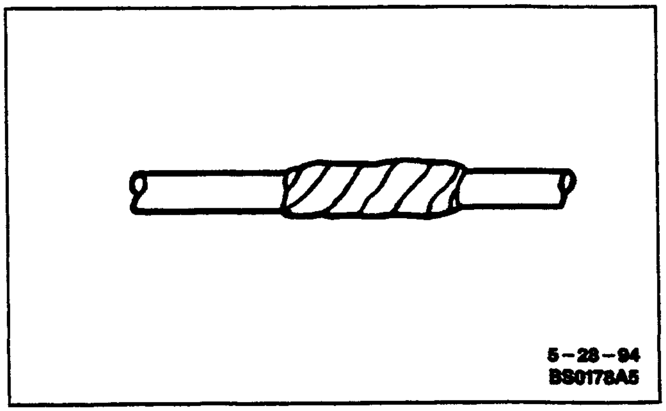


Figure 18 - Proper Taping

REPAIR PROCEDURES

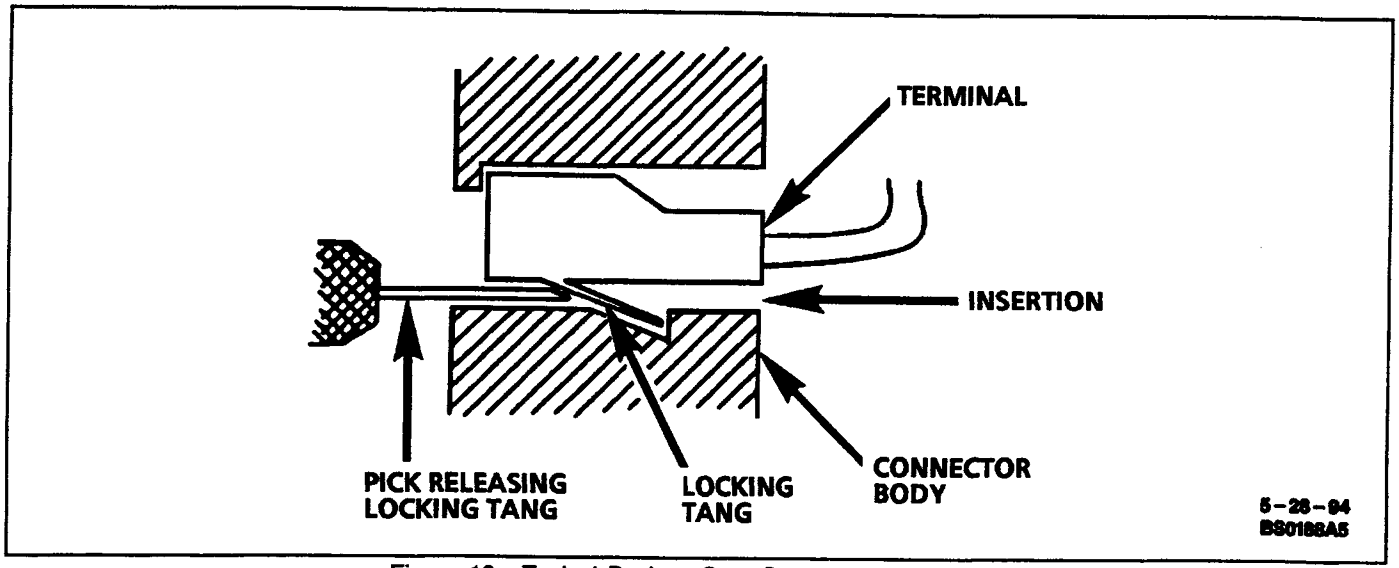

TERMINAL
INSERTION
PICK RELEASING LOCKING TANG
LOCKING TANG
CONNECTOR BODY
5-28-94
BS0188A5

Figure 19 - Typical Push to Seat Connector and Terminal

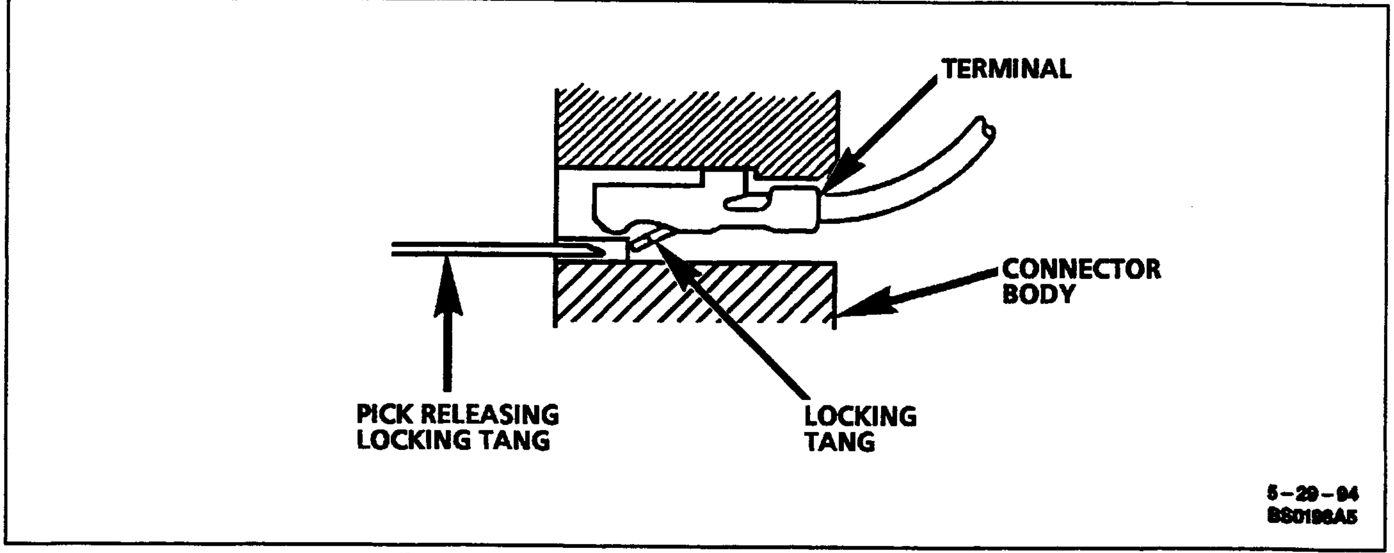

TERMINAL
CONNECTOR BODY
PICK RELEASING LOCKING TANG
LOCKING TANG
5-29-94
BS0198A5

Figure 20 - Typical Pull to Seat Connector and Terminal

Step 1:

Remove any Connector Position Assurance (CPA) Locks. CPAs are designed to retain connectors when mated.

Step 2:

Remove any TPA Locks. TPAs are designed to keep the terminal from backing out of the connector.

Step 3:

Open any secondary locks. A secondary lock aids in terminal retention and is usually molded to the connector.

Step 4:

Separate the connector halves and back out seals.

Step 5:

Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 6:

Locate the terminal lock tang in the connector canal.

Step 7:

Insert the proper size pick (refer to J 38125-A Terminal Repair Kit) straight into the connector canal at the mating end of the connector.

Step 8:

Depress the locking tang to unseat the terminal.

- Push to Seat - Gently pull on the lead to remove the terminal through the back of the connector.
- Pull to Seat - Gently push on the lead to remove the terminal through the front of the connector.

NOTICE: Never use force to remove a terminal from a connector.

Step 9:

Inspect terminal and connector for damage. Repair as necessary (refer to "Terminal Repair," page 8A-5-11).

Step 10:

Reform lock tang and reseat terminal in connector body. Apply grease if connector was originally equipped with grease.

Step 11:

Install any CPAs or TPAs, close any secondary locks and join connector halves.

Weather Pack® CONNECTOR REPAIR

Follow the steps below to repair Weather Pack® connectors (Figure 21).

Step 1:

Separate the connector halves.

Step 2:

Open secondary lock. A secondary lock aids in terminal retention and is usually molded to the connector.

Step 3:

Grasp the lead and push the terminal to the forward most position. Hold the lead at this position.

Step 4:

Insert the Weather Pack® terminal removal tool into the front (mating end) of the connector cavity until it rests on the cavity shoulder.

Step 5:

Gently pull on the lead to remove the terminal through the back of the connector.

> **NOTICE:** Never use force to remove a terminal from a connector.

Step 6:

Inspect the terminal and connector for damage. Repair as necessary (refer to "Terminal Repair" on the following page).

Step 7:

Reform the lock tang and reseat terminal in connector body.

Step 8:

Close secondary locks and join connector halves.

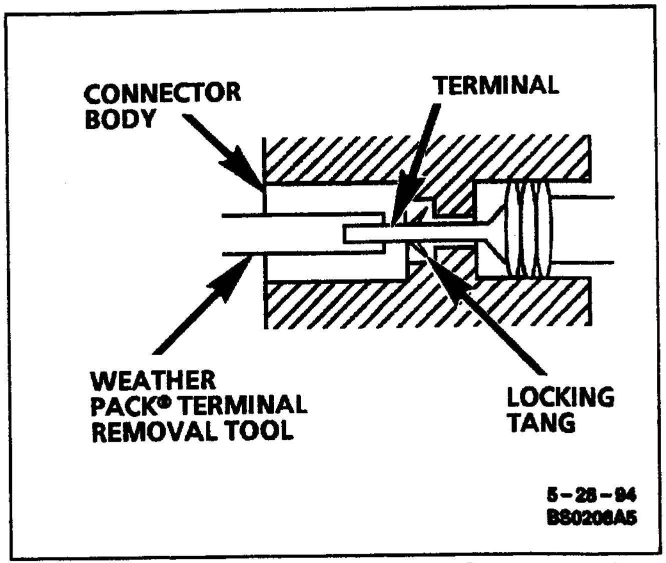


Figure 21 - Typical Weather Pack® Connector and Terminal

TERMINAL REPAIR

The following repair procedures can be used to repair Push to Seat, Pull to Seat or Weather Pack® terminals (Figure 22). Some terminals do not require all steps shown. Skip those that don't apply. The Terminal Repair Kit (J 38125-A) contains further information.

Step 1:

Cut off terminal between core and insulation crimp (minimize wire loss) and remove seal for Weather Pack® terminals.

Step 2:

Apply correct seal per gauge size of wire and slide back along wire to enable insulation removal (Weather Pack® terminals only).

Step 3:

Remove insulation.

Step 4:

Align seal with end of cable insulation (Weather Pack® terminals only).

Step 5:

Position strip (and seal for Weather Pack®) in terminal.

Step 6:

Hand crimp core wings.

REPAIR PROCEDURES

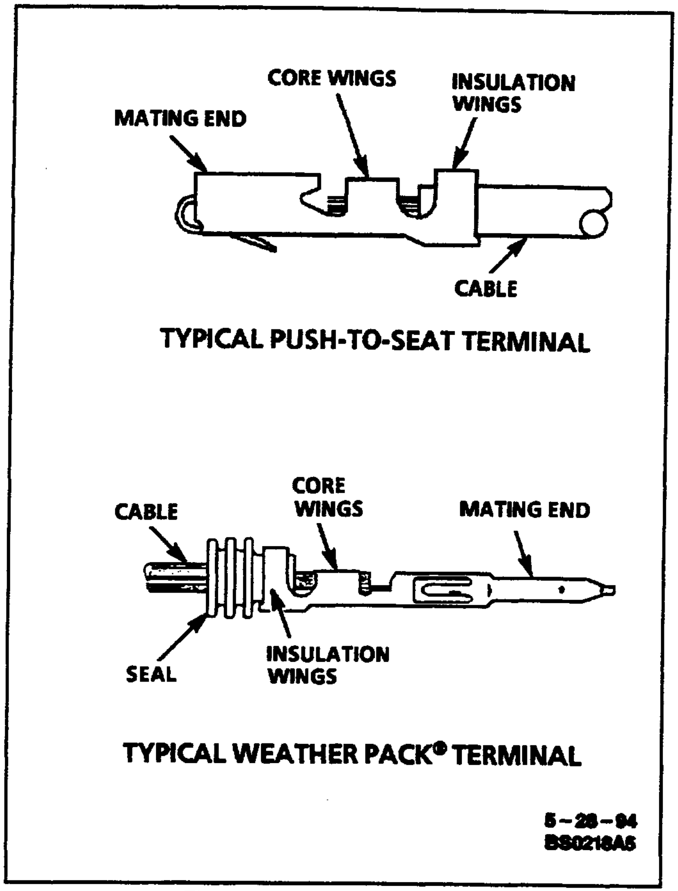

CORE WINGS
INSULATION WINGS
MATING END
CABLE
TYPICAL PUSH-TO-SEAT TERMINAL
CORE WINGS
CABLE
MATING END
SEAL
INSULATION WINGS
TYPICAL WEATHER PACK® TERMINAL
5-28-94
BS0218A5

Figure 22 - Terminal Repair

Step 7:

Hand crimp insulation wings (non Weather Pack®). Hand crimp insulation wings around seal and cable (Weather Pack®).

Step 8:

Solder all hand crimped terminals.

DIODE REPLACEMENT

Many vehicle electrical systems use a diode to isolate circuits and protect the components from voltage spikes. When installing a new diode, use the following procedure:

Step 1: Open the Harness

If the diode is taped to the harness, remove all of the tape.

Step 2: Remove Inoperative Diode

Paying attention to current flow direction, remove inoperative diode from the harness with a suitable soldering tool. If the diode is located next to a connector terminal, remove the terminal(s) from the connector to prevent damage from the soldering tool.

Step 3: Strip the Insulation

Carefully strip away a section of insulation next to the old soldered portion of the wire(s). Do not remove any more than is needed to attach the new diode.

Step 4: Install New Diode

Check current flow direction of the new diode, being sure to install the diode with correct bias. Reference the appropriate service manual wiring schematic to obtain the correct diode installation position. Reference Figure 23 for replacement diode symbols and current flow explanations. Attach the new diode to the wire(s) using 60/40 rosin core solder. Use a heat sink (aluminum alligator clip) attached across the diode wire ends to protect the diode from excess heat. Follow the manufacturer's instructions for the soldering equipment you are using.

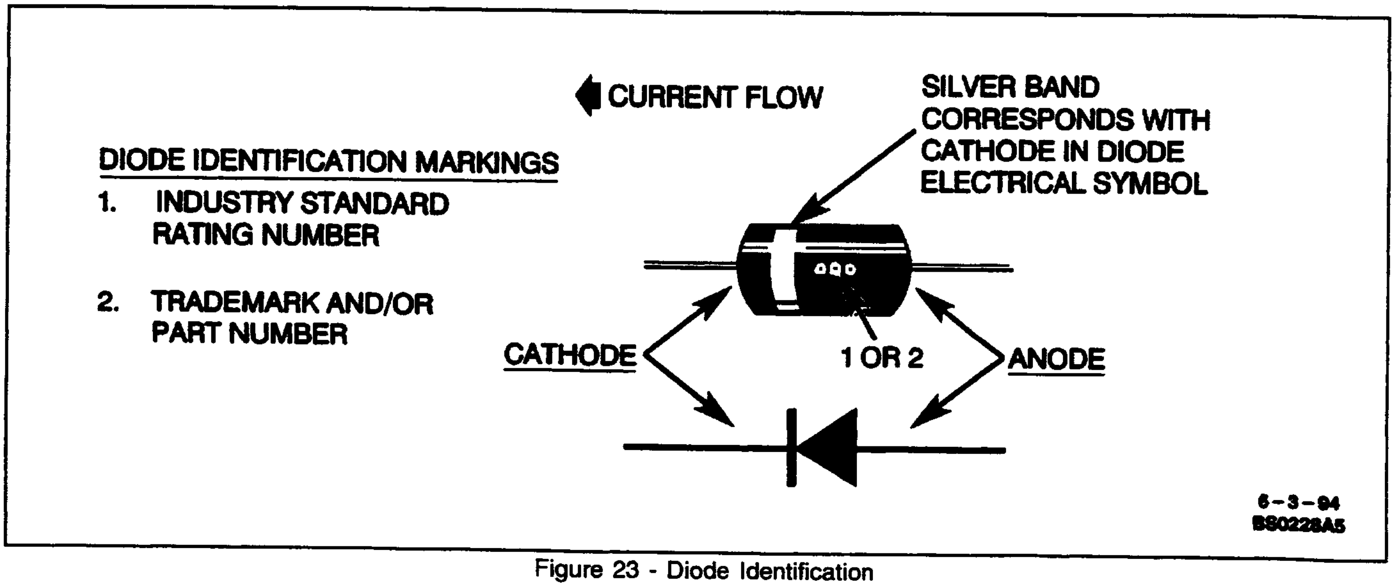

CURRENT FLOW
SILVER BAND CORRESPONDS WITH CATHODE IN DIODE ELECTRICAL SYMBOL
DIODE IDENTIFICATION MARKINGS
1. INDUSTRY STANDARD RATING NUMBER
2. TRADEMARK AND/OR PART NUMBER
CATHODE
1 OR 2
ANODE
6-3-94
BS0228A5

Figure 23 - Diode Identification

Step 5: Install Terminal(s)

Install terminal(s) into the connector body if previously removed in step 2.

Step 6: Tape Diode to Harness

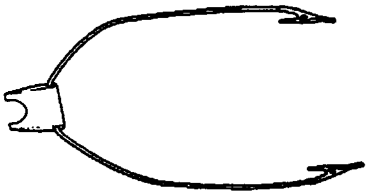
Tape the diode to the harness or connector using electrical tape. To prevent shorts to ground and water intrusion, completely cover all exposed wire and diode attachment points.

ACCEPTABLE DIODE REPLACEMENTS

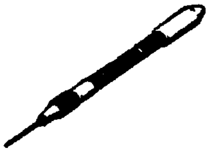
Diode Brand	Rating Number	Rating
GMSPO	1N4004	1 A, 400 PIV
GMSPO	1N5404	3 A, 400 PIV
GMSPO	1N4001	1 A, 50 PIV
GMSPO	1N4005	1 A, 600 PIV
GMSPO	1N4004	1 A, 400 PIV

In the event 1 A, 50 PIV (Peak Inverse rating) diodes are unavailable, a universal diode with a 1 A, 400 PIV rating can be used for the following applications:

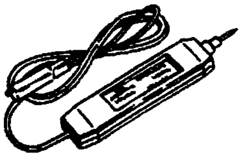
- A/C Compressor Clutch.
- ABS/4WAL (the ABS Diode on the Delco Moraine is hidden inside of an electrical connector under the carpet at the right panel).
- Wiper.
- Charging system (hidden in wire harness).
- Parking brake (vehicle with ABS).
- Relays.
- Solenoids.
- Diesel glow plug circuit.



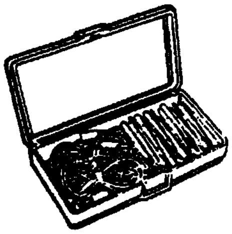
J 36169
Jumper Wire



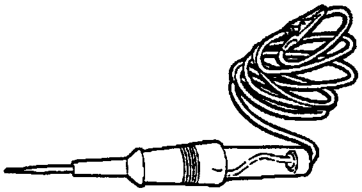
J 35689 – A
Micro – Pack Connector
Terminal Remover



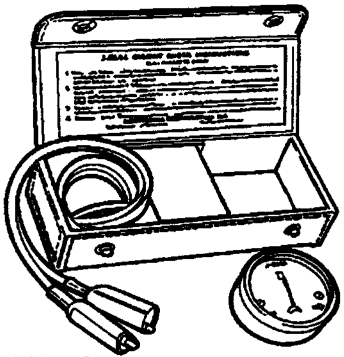
J 34636
Solenoid, Relay
and Circuit Tester



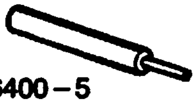
J 35616 – A
Connector Test Adapter Kit



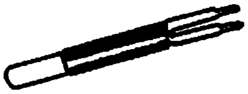
J 34142 – B
Unpowered Test Light



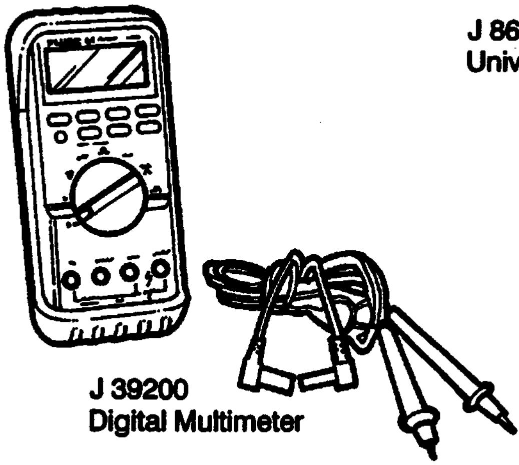
J 8681 – A
Universal Short Checker



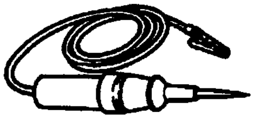
J 36400 – 5
Weather Pack II Terminal Remover



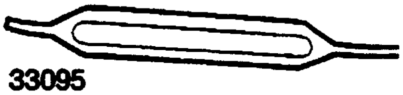
J 22727
Electrical Terminal Remover



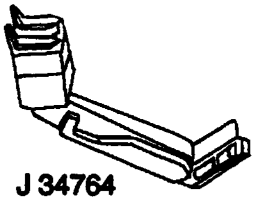
J 39200
Digital Multimeter



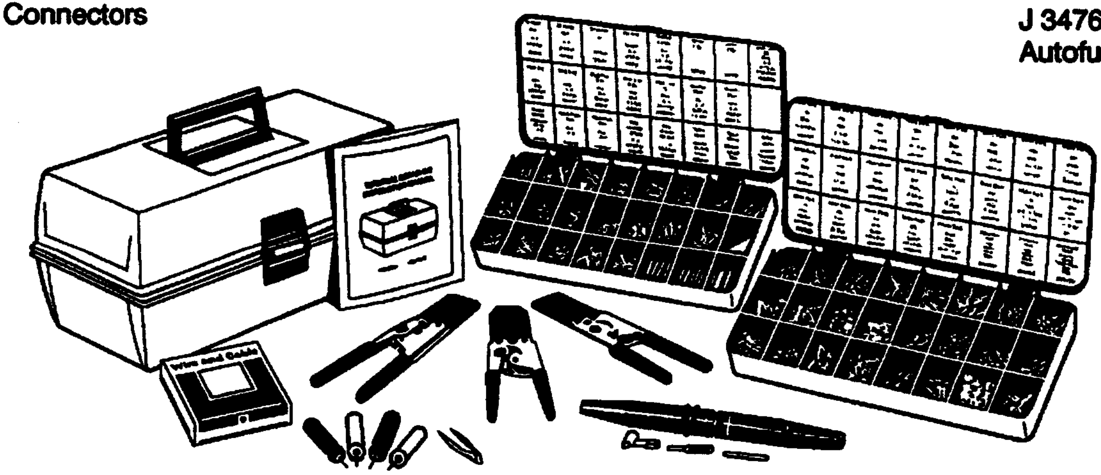
J 21008 – A
Self – Powered Test Light



J 33095
Terminal Remover: Micro Pack,
Com – Pack III and ECM Edgeboard
Connectors



J 34764
Autofuse Tester



J 38125 – A
Terminal Repair Kit

1-22-96
BS0238A5

Special Tools

GMSPO SERVICE PARTS

GMSPO STANDARD PARTS CATALOG

Check the GMSPO Standard Parts Catalog, Group 8.965. Fuses, circuit breakers, connectors, terminals, conduit, pigtail kits, and seals are listed in that group.

GMSPO CARLINE PARTS CATALOG

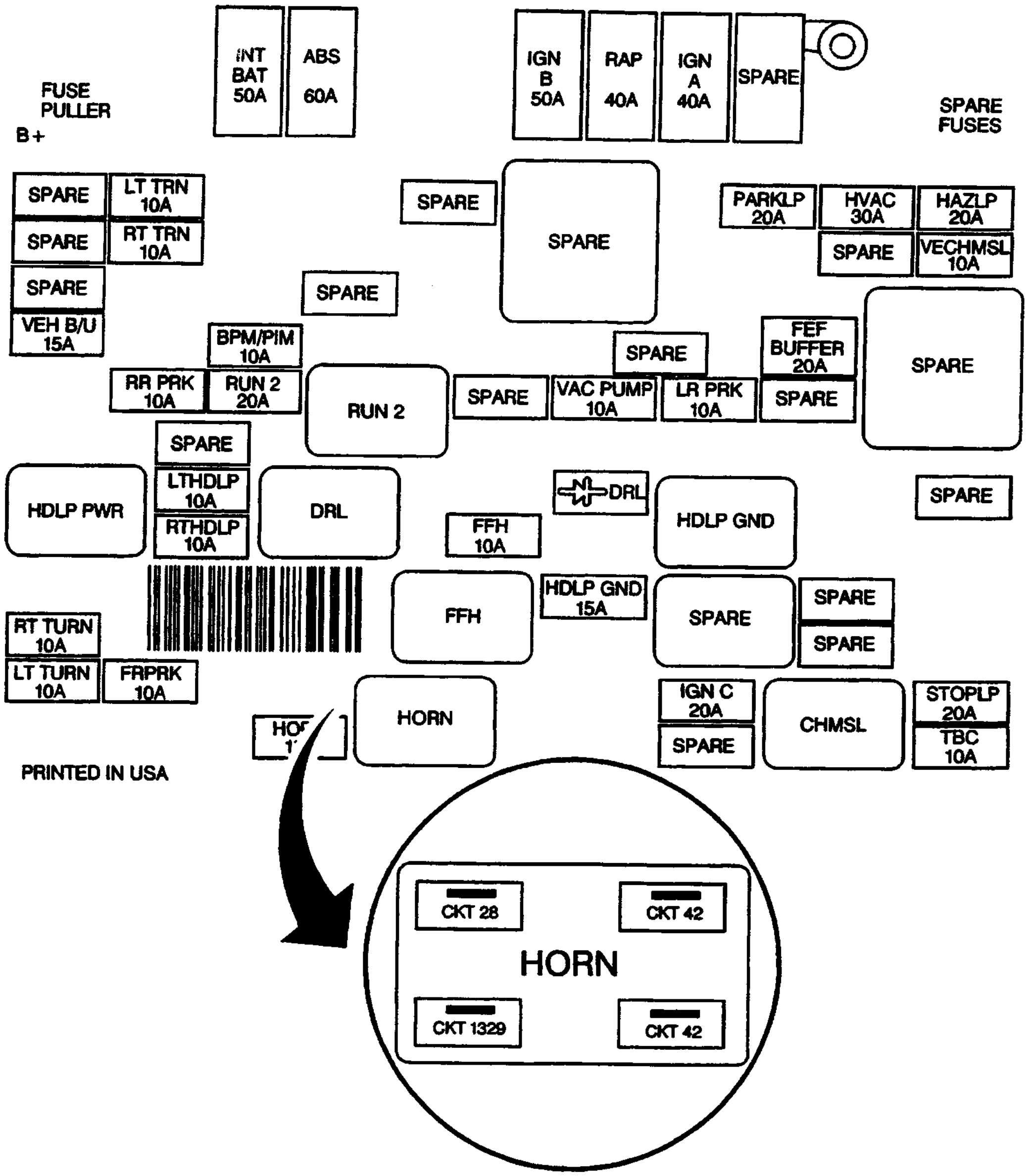
The GMSPO Carline Parts Catalog, Group 2.535 contains connector repair kits with terminals and leads.

COMPLETE HARNESS

In many cases repairs can be made by ordering pigtail assemblies (prewired connectors) rather than the entire wiring harness. Only order complete harnesses when there is major damage to the wiring harness. Always repair minor damage. Complete harnesses and pigtail part numbers can be found in the GMSPO Carline Parts Catalog.

POWER DISTRIBUTION

Underhood Bussed Electrical Center (UBEC) Details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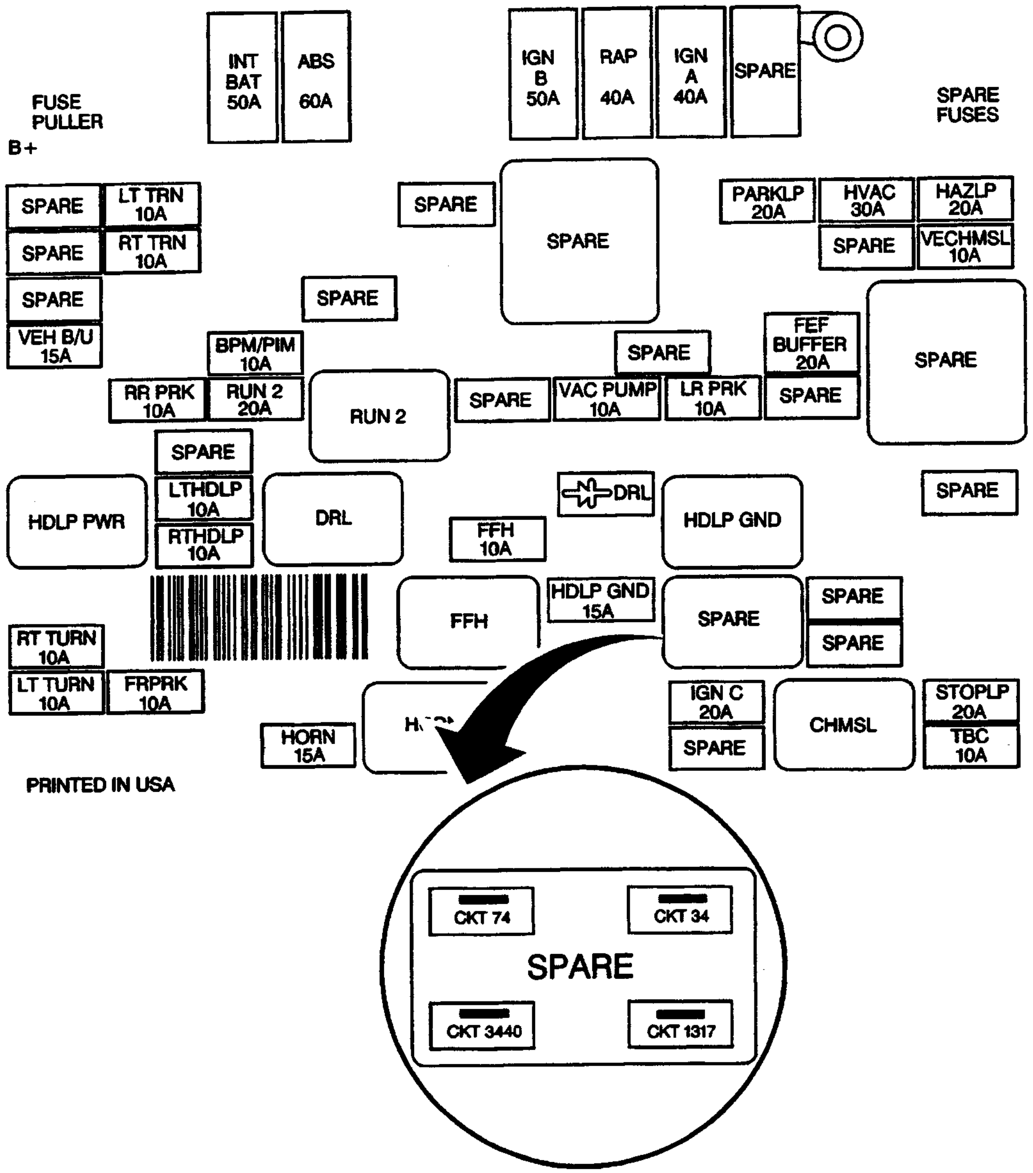
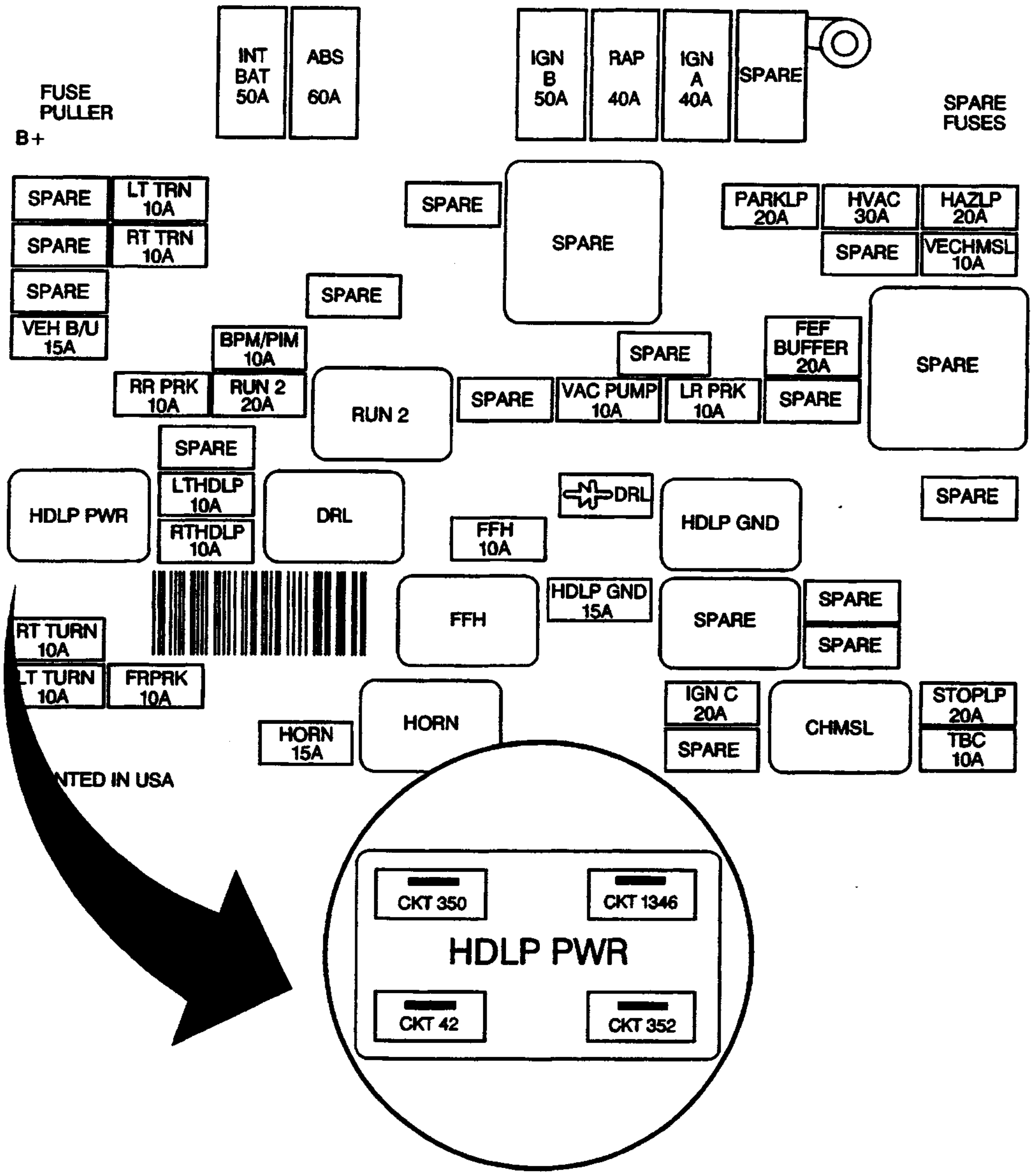
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
FUSE PULLER
B+
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
SPARE
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 28
CKT 42
HORN
CKT 1329
CKT 42


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
H
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 74
CKT 34
SPARE
CKT 3440
CKT 1317

POWER DISTRIBUTION

Underhood Bussed Electrical Center (UBEC) Details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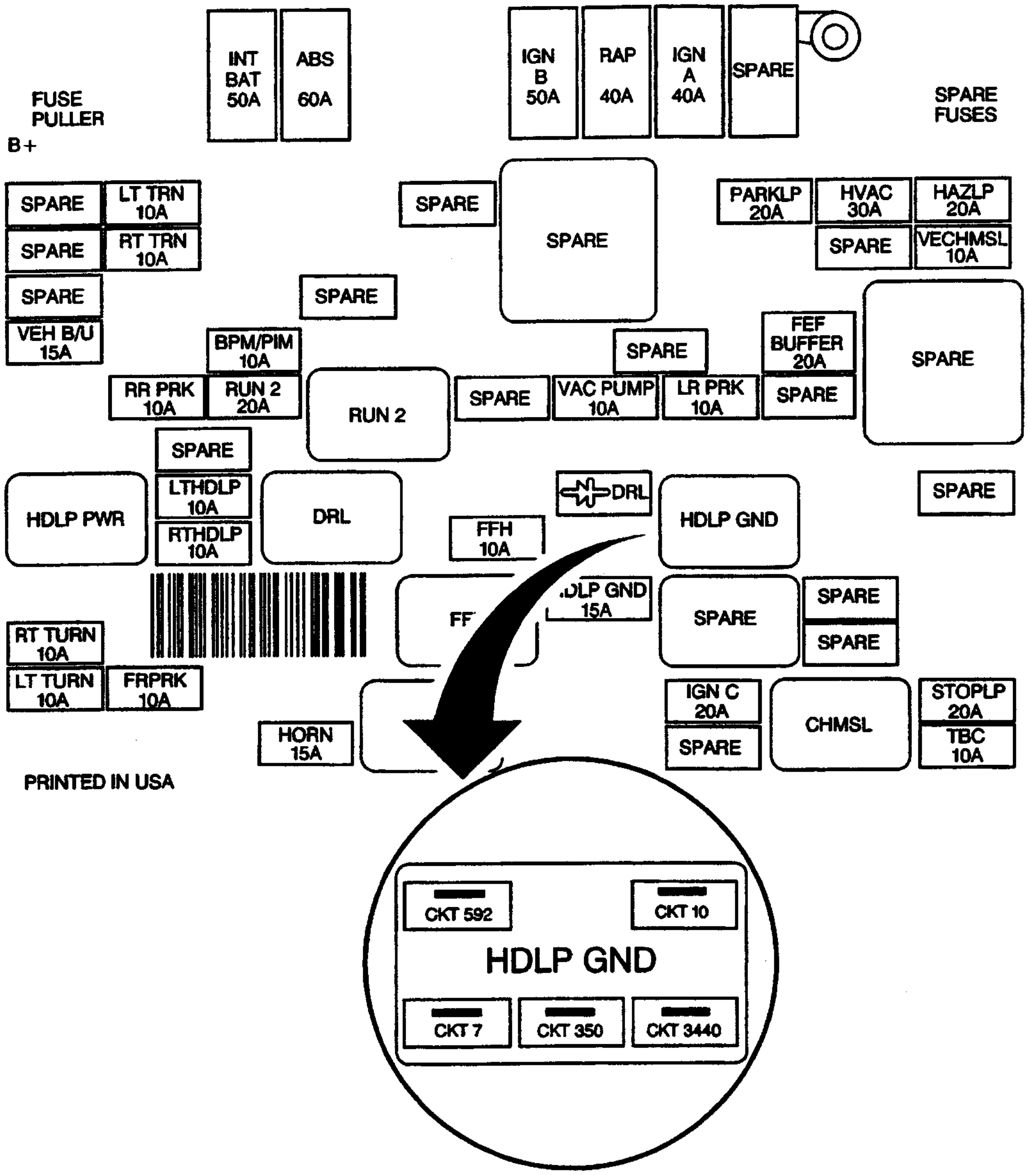
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
FUSE PULLER
B+
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
NTED IN USA
CKT 350
CKT 1346
HDLP PWR
CKT 42
CKT 352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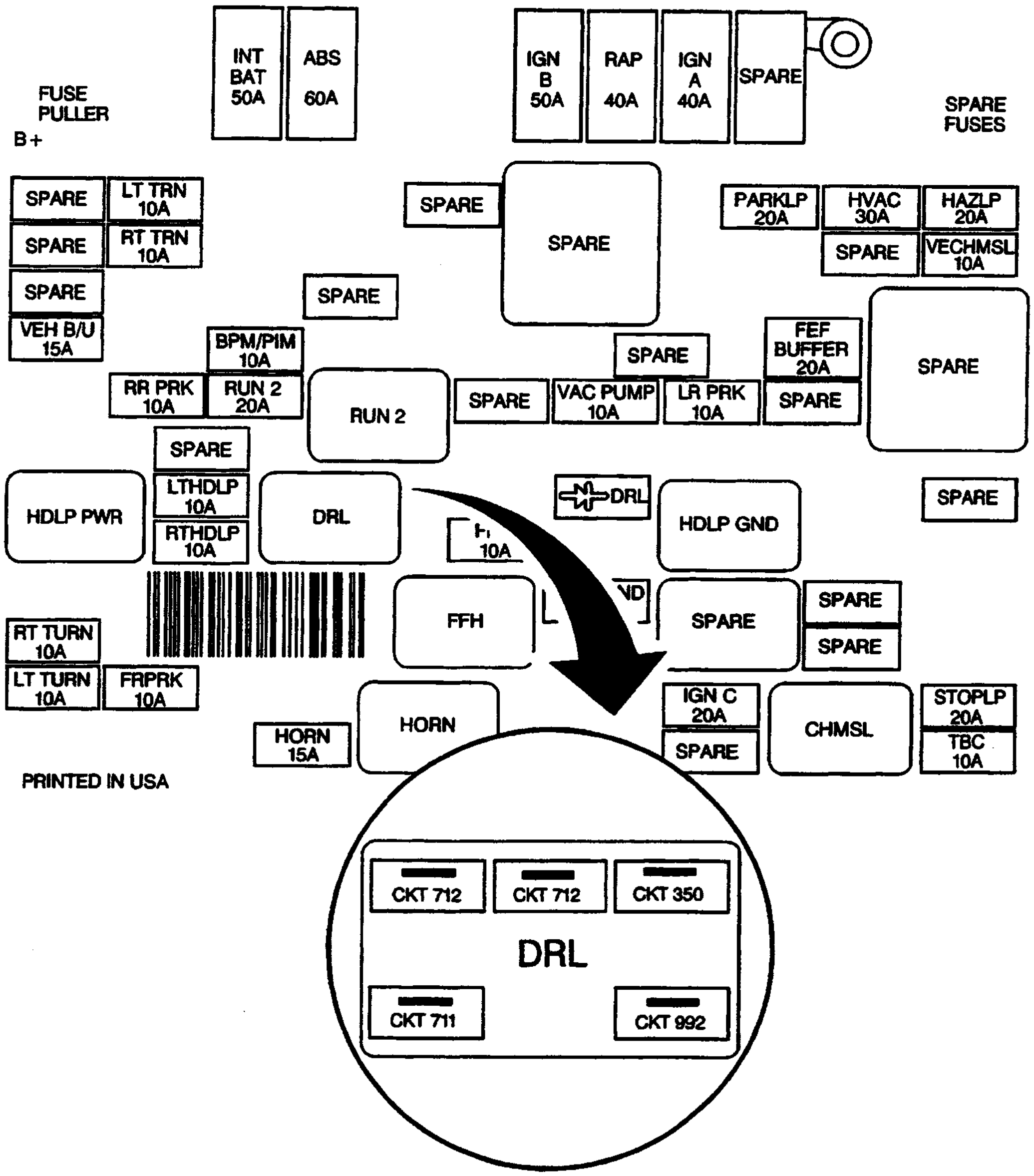
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
SPARE
FEF BUFFER 20A
SPARE
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
HDLP GND
SPARE
FFH 10A
FF
DLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 592
CKT 10
HDLP GND
CKT 7
CKT 350
CKT 3440

POWER DISTRIBUTION

Underhood Bussed Electrical Center (UBEC) Details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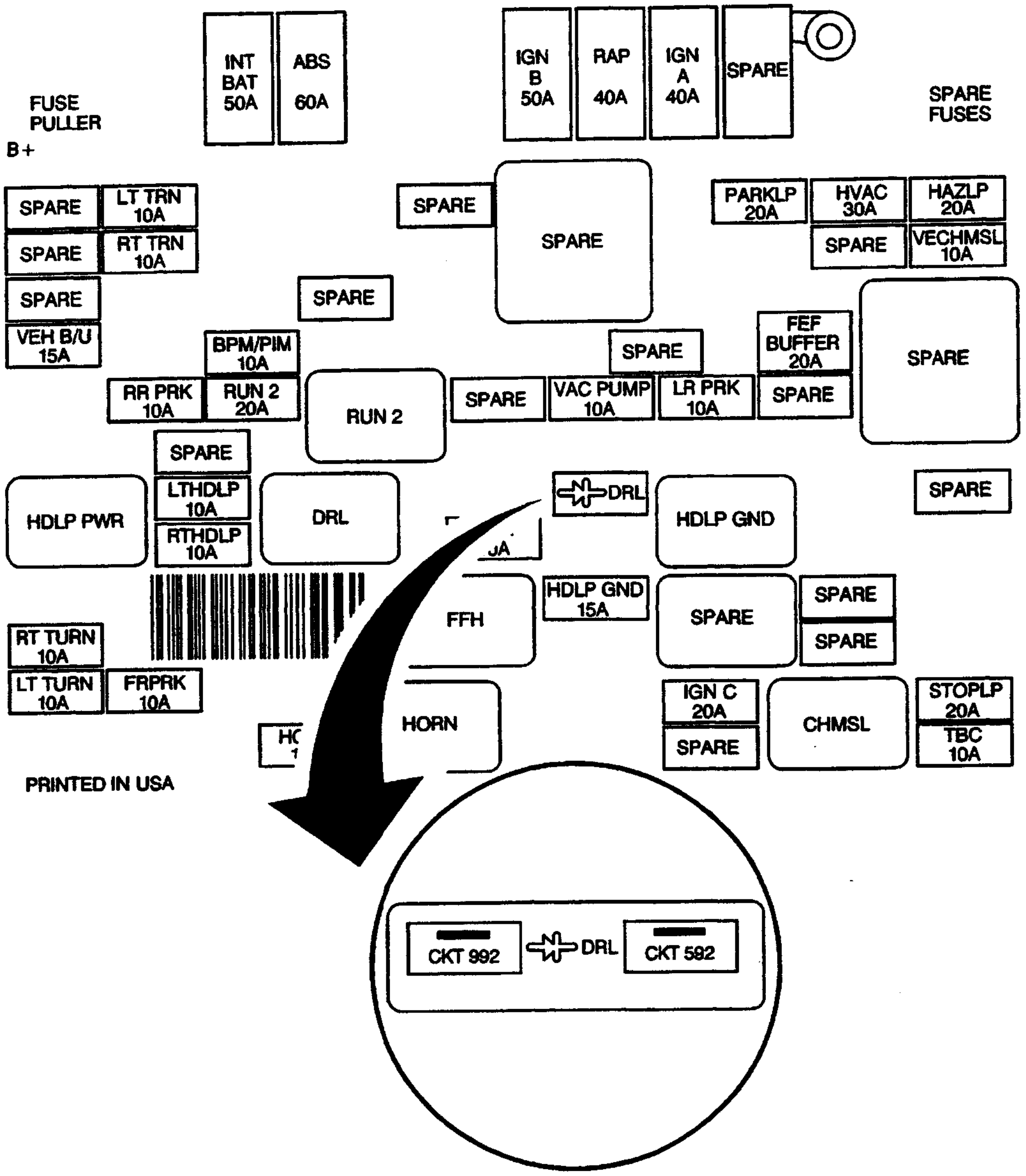
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
FUSE PULLER
B+
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
SPARE
BPM/PIM 10A
SPARE
FEF BUFFER 20A
SPARE
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
10A
HDLP GND
SPARE
FFH
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 712
CKT 712
CKT 350
DRL
CKT 711
CKT 992


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
SPARE
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
FEF BUFFER 20A
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
SPARE
LTHDLP 10A
RTHDLP 10A
HDLP PWR
DRL
DRL
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 992
DRL
CKT 582

Fuse/Circuit Breaker	Rating	Description
MAXI FUSES		
STUD #2	30A	Not Used
INT BAT	50A	RDO BATT fuse, PIM/BPM fuse, BATT VALVE/FFH fuse, HDLP SW fuse, HTCM/BCIM fuse, CTSY LP fuse, CIGAR LTR fuse
IGN B	50A	Ignition Switch RUN/ACC and RUN positions
RAP	50A	Retained Accessory Power Relay
ABS	60A	Electronic Brake Control Module Assembly
IGN A	40A	Ignition Switch START/RUN positions
NOT USED		
NOT USED		
MINI FUSES		
TBC	10A	Body Control Module
IGN C	20A	Ignition Switch START, START/RUN/OFF, and START/RUN positions
FEF BUFFER	20A	A/C Condensor Fan Motor Buffer

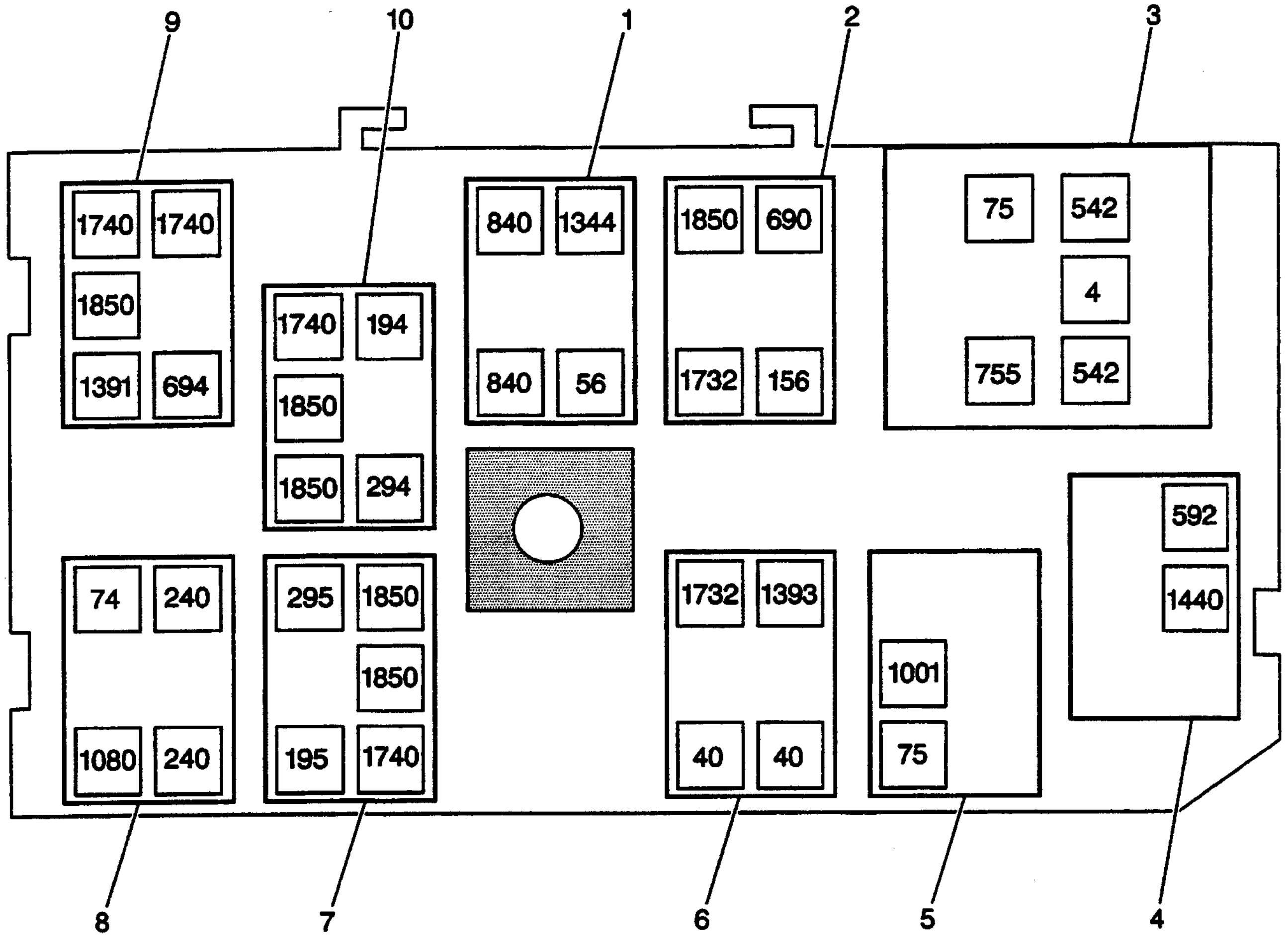
POWER DISTRIBUTION

Underhood Bussed Electrical Center (UBEC) Details

Fuse/Circuit Breaker	Rating	Description
HVAC	30A	Blower Motor Relay
PARK LP	20A	Park Lamp Relay, Headlamp Switch
HAZ LP	20A	Hazard Switch
STOP LP	20A	Stoplamps Switch
HDLP GND	15A	Fog Lamp Relay, Headlamp Ground Relay
RUN 2	20A	Run 2 Relay
FFH	10A	Fuel Fired Heater
VAC PUMP	10A	P/B Booster Vacuum Pump, Auxiliary Heater Relay
FR PRK	10A	Side Marker Lamp LH and RH Front, Turn Signal and Park Lamp LH and RH Front
LR PRK	10A	Tail/Stop/Turn Signal LH Rear, Side Marker Lamp LH Rear, License Lamp LH
RR PRK	10A	Tail/Stop/Turn Signal RH Rear, Side Marker Lamp RH Rear, License Lamp RH
HORN	15A	Horn, LH, Horn, RH
LT TURN	10A	Side Marker Lamp, LH Front, Park and Turn Signal Lamp, LH Front
RT TURN	10A	Side Marker Lamp, RH Front, Park and Turn Signal Lamp, RH Front
LT TRN	10A	Tail/Stop/Turn Signal, LH Rear
RT TRN	10A	Tail/Stop/Turn Signal, RH Rear
VEH B/U	10A	Back-up Lamps
VEH CHMSL	10A	Dome and High Mounted Stop Lamp
LT HDLP	20A	Headlamp, LH
RT HDLP	20A	Headlamp, RH
BPM/PIM	20A	Battery Pack Control Module, Body Control Interface Module

POWER DISTRIBUTION

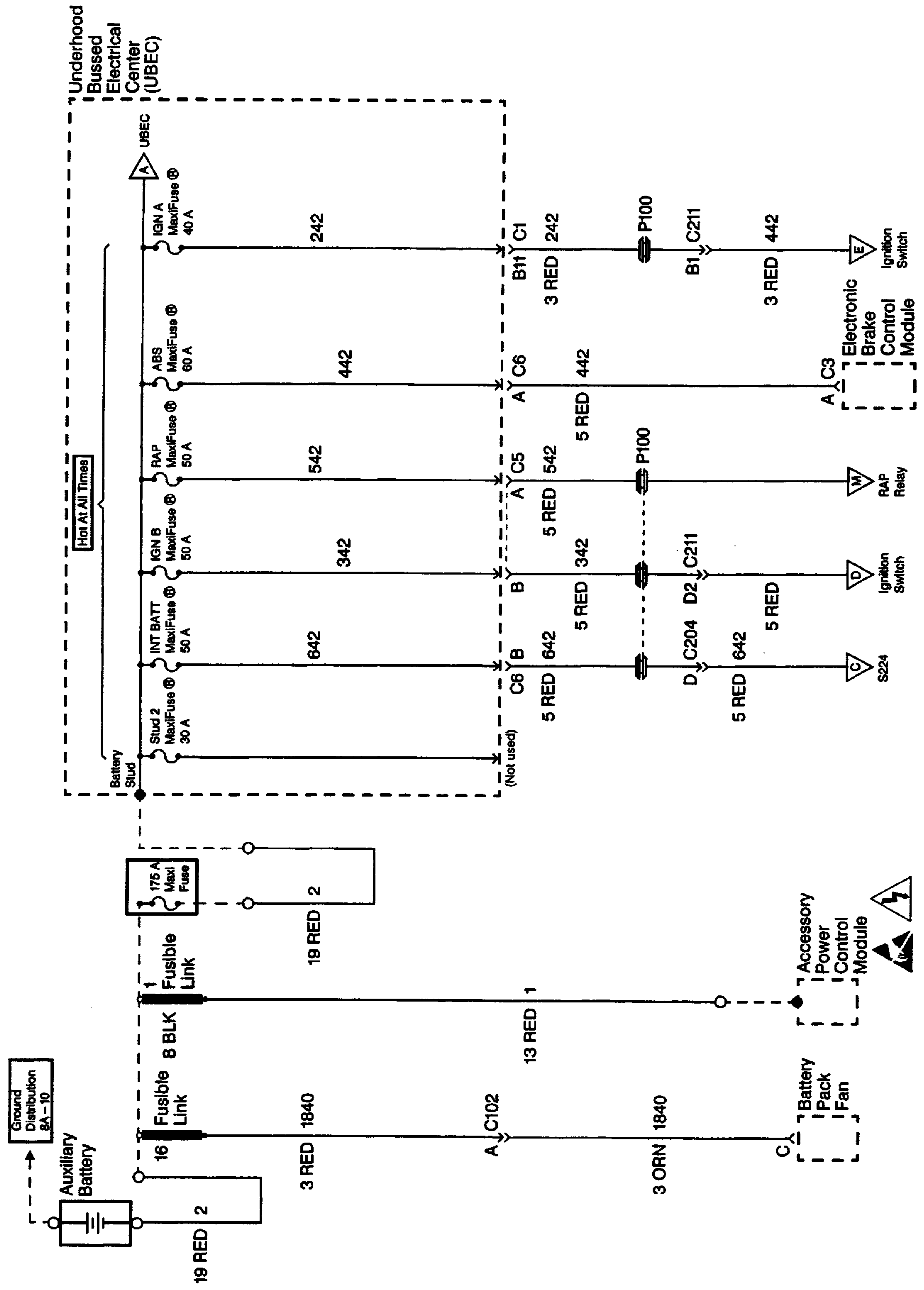
Body Bussed Electrical Center

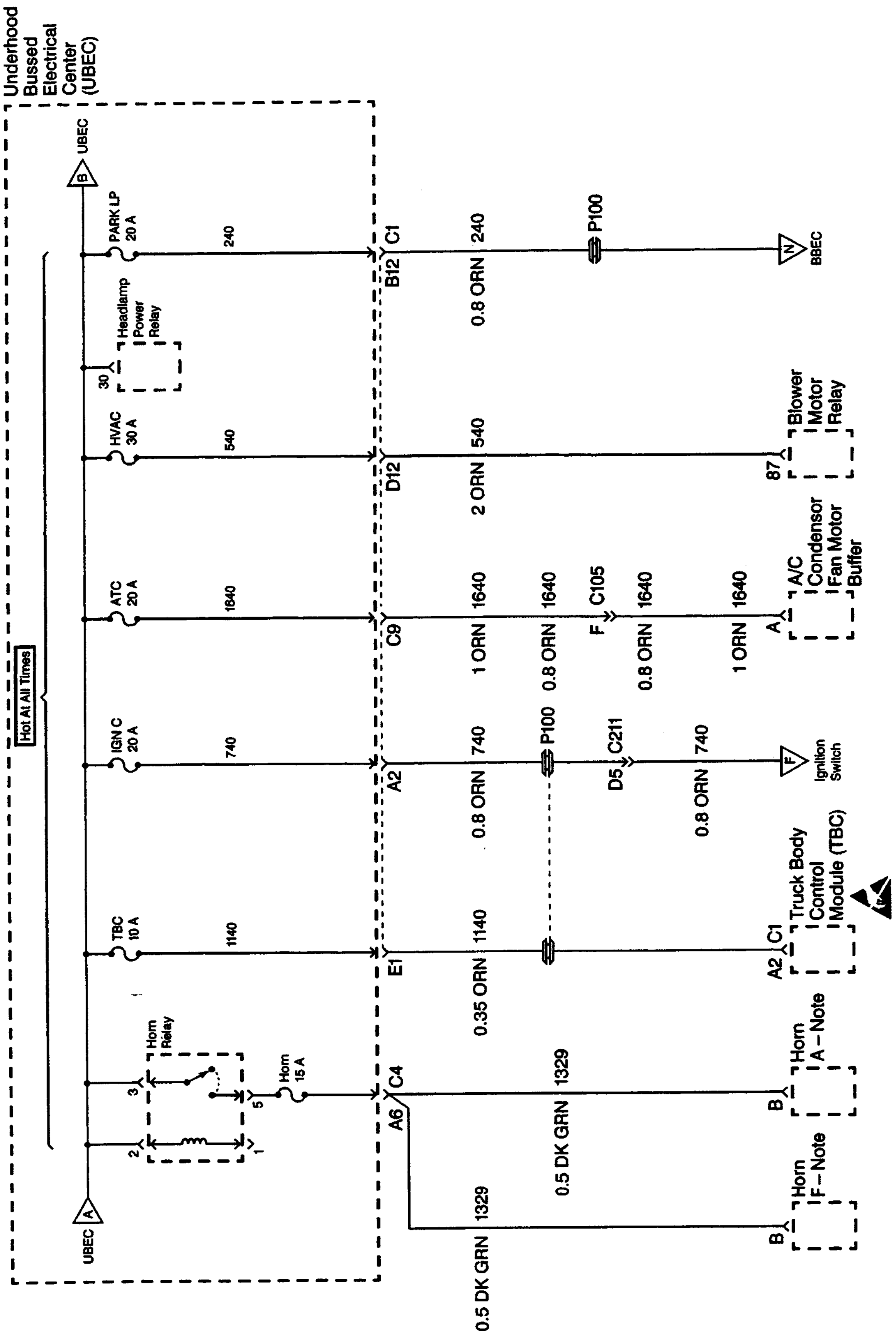

9
10
1
2
3
1740
1740
1850
1391
694
1740
194
1850
1850
294
840
1344
840
56
1850
690
1732
156
75
542
4
755
542
592
1440
74
240
1080
240
295
1850
1850
195
1740
1732
1393
40
40
1001
75
8
7
6
5
4

Legend

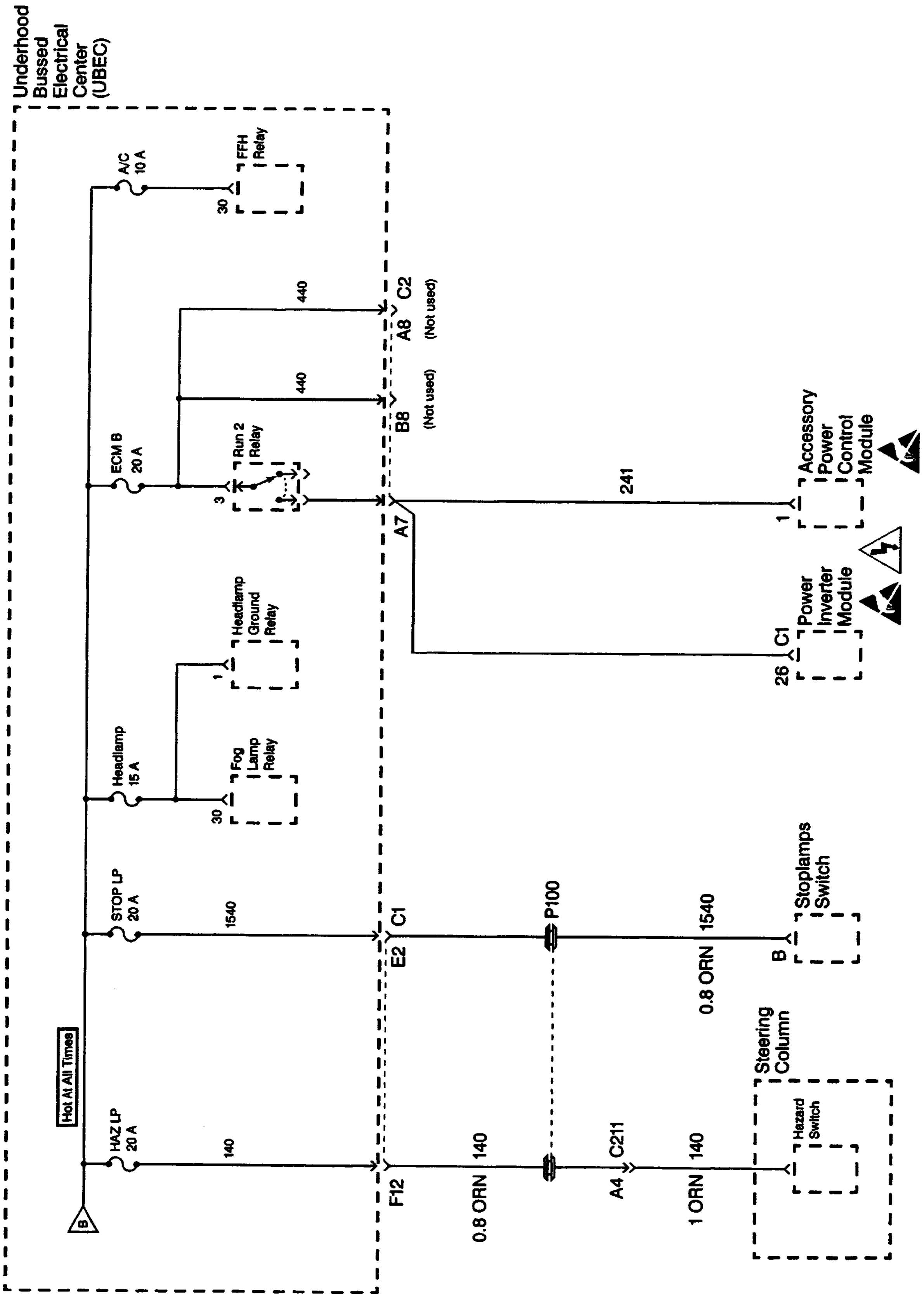
- (1) Liftglass Relay (Not Used)
- (2) Courtesy Lamp Relay
- (3) Retained Accessory Power Relay
- (4) Power Seats Circuit Breaker (Not Used)
- (5) Power Windows Circuit Breaker (Not Used)
- (6) Inadvertent Power Relay
- (7) Door Lock Relay
- (8) Park Lamp Relay
- (9) Driver Door Unlock Relay
- (10) Door Unlock Relay

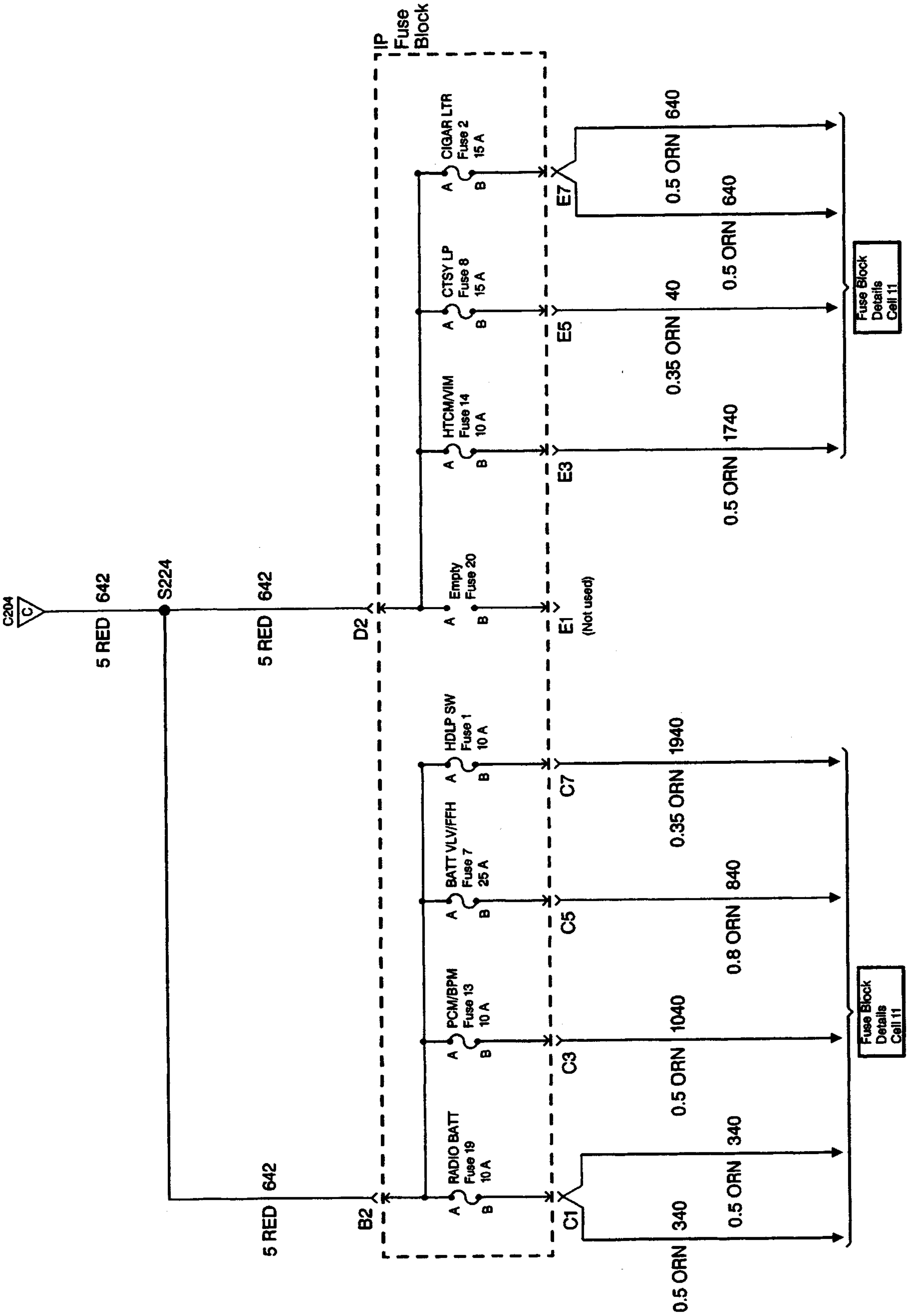
POWER DISTRIBUTION

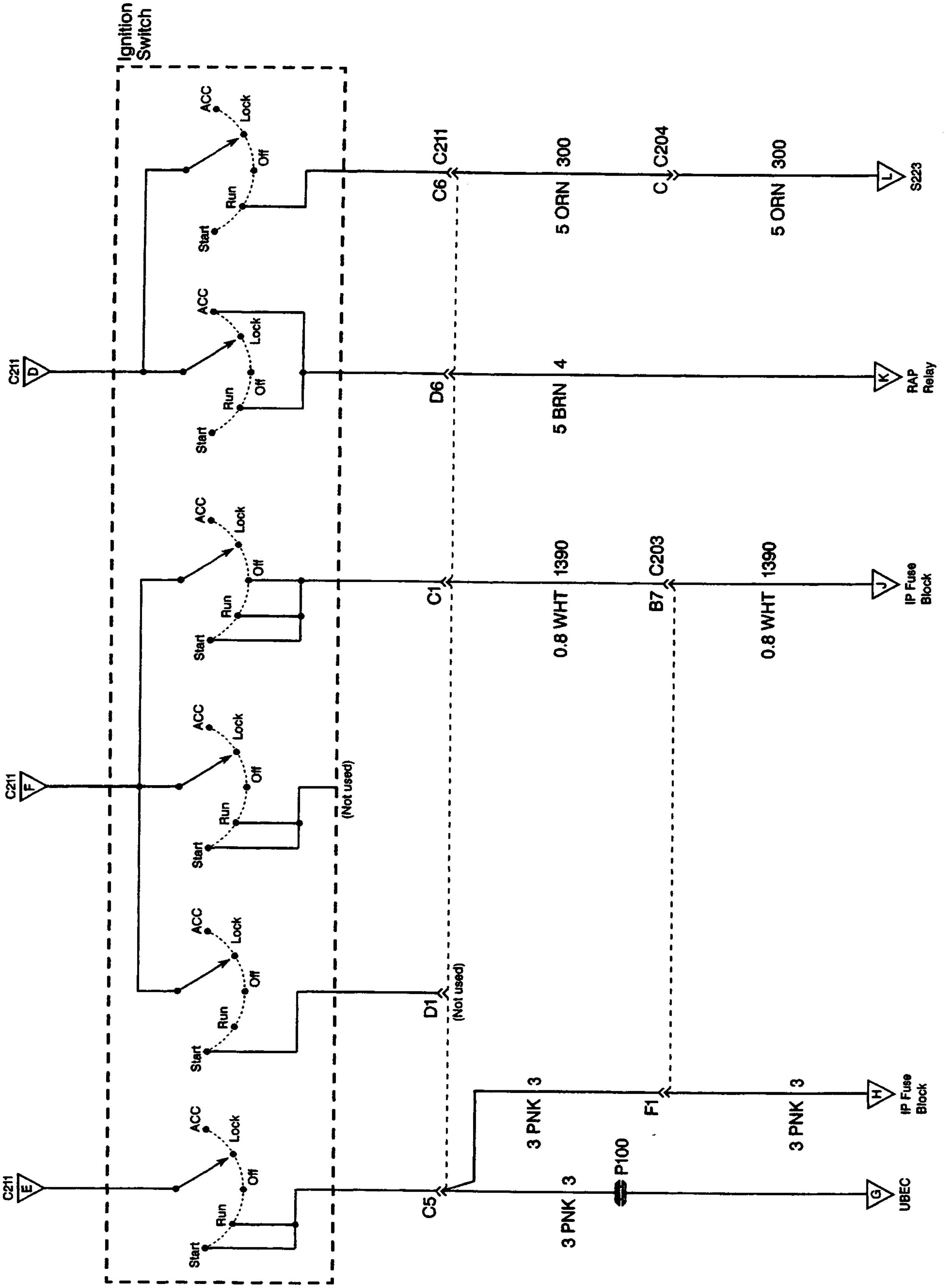

Underhood Bussed Electrical Center (UBEC)
A UBEC
Hot At All Times
IGN A MaxiFuse ® 40 A
ABS MaxiFuse ® 60 A
RAP MaxiFuse ® 50 A
IGN B MaxiFuse ® 50 A
INT BATT MaxiFuse ® 50 A
Stud 2 MaxiFuse ® 30 A
Battery Stud
242
442
542
342
642
B11 C1
A C6
A C5
B
B C6
(Not used)
242 3 RED
442 5 RED
542 5 RED
342 5 RED
642 5 RED
P100
P100
C211 B1
C211 D2
C204 D
442 3 RED
5 RED
642 5 RED
E Ignition Switch
A C3 Electronic Brake Control Module
M RAP Relay
D Ignition Switch
C S224
175 A Maxi Fuse
2 19 RED
1 Fusible Link
8 BLK
13 RED 1
Accessory Power Control Module
16 Fusible Link
3 RED 1840
A C102
3 ORN 1840
C Battery Pack Fan
Auxiliary Battery
Ground Distribution 8A-10
2
19 RED

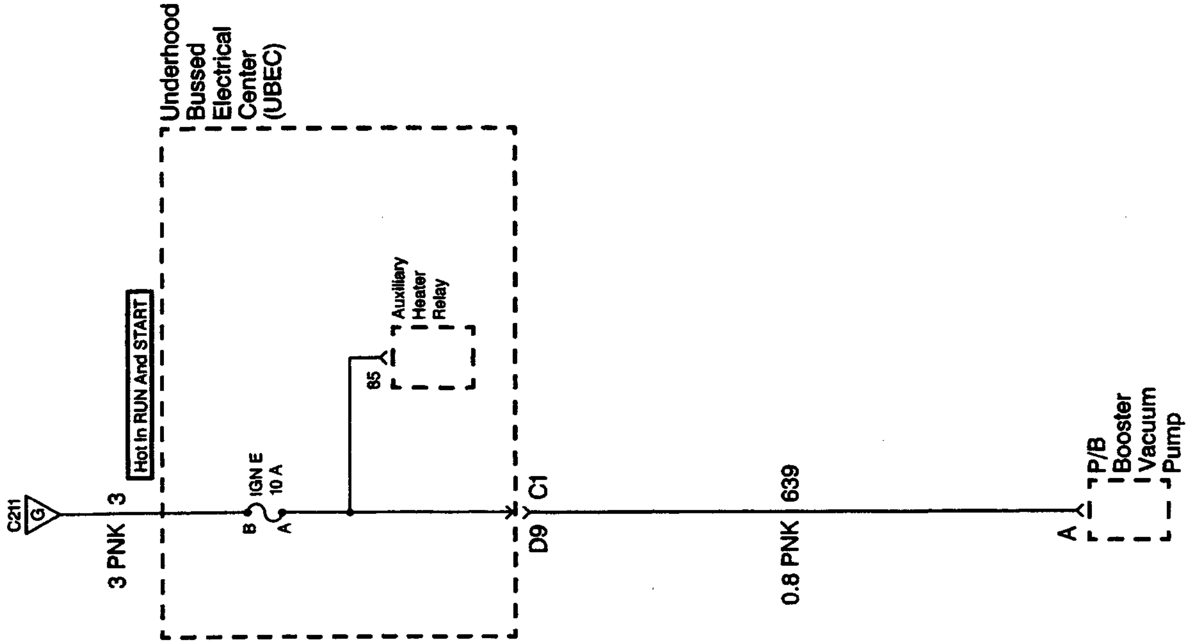

Underhood Bussed Electrical Center (UBEC)
UBEC
B
PARK LP 20 A
240
Headlamp Power Relay
30
HVAC 30 A
540
ATC 20 A
1640
Hot At All Times
IGN C 20 A
740
TBC 10 A
1140
Horn Relay
3
2
5
1
Horn 15 A
A
UBEC
C1
B12
D12
C9
A2
E1
C4
A6
240
0.8 ORN
P100
N
BBEC
540
2 ORN
87
Blower Motor Relay
1640
1 ORN
1640
0.8 ORN
F
C105
1640
0.8 ORN
1640
1 ORN
A
A/C Condensor Fan Motor Buffer
740
0.8 ORN
P100
D5
C211
740
0.8 ORN
F
Ignition Switch
1140
0.35 ORN
A2
C1
Truck Body Control Module (TBC)
1329
0.5 DK GRN
B
Horn A-Note
1329
0.5 DK GRN
B
Horn F-Note

POWER DISTRIBUTION

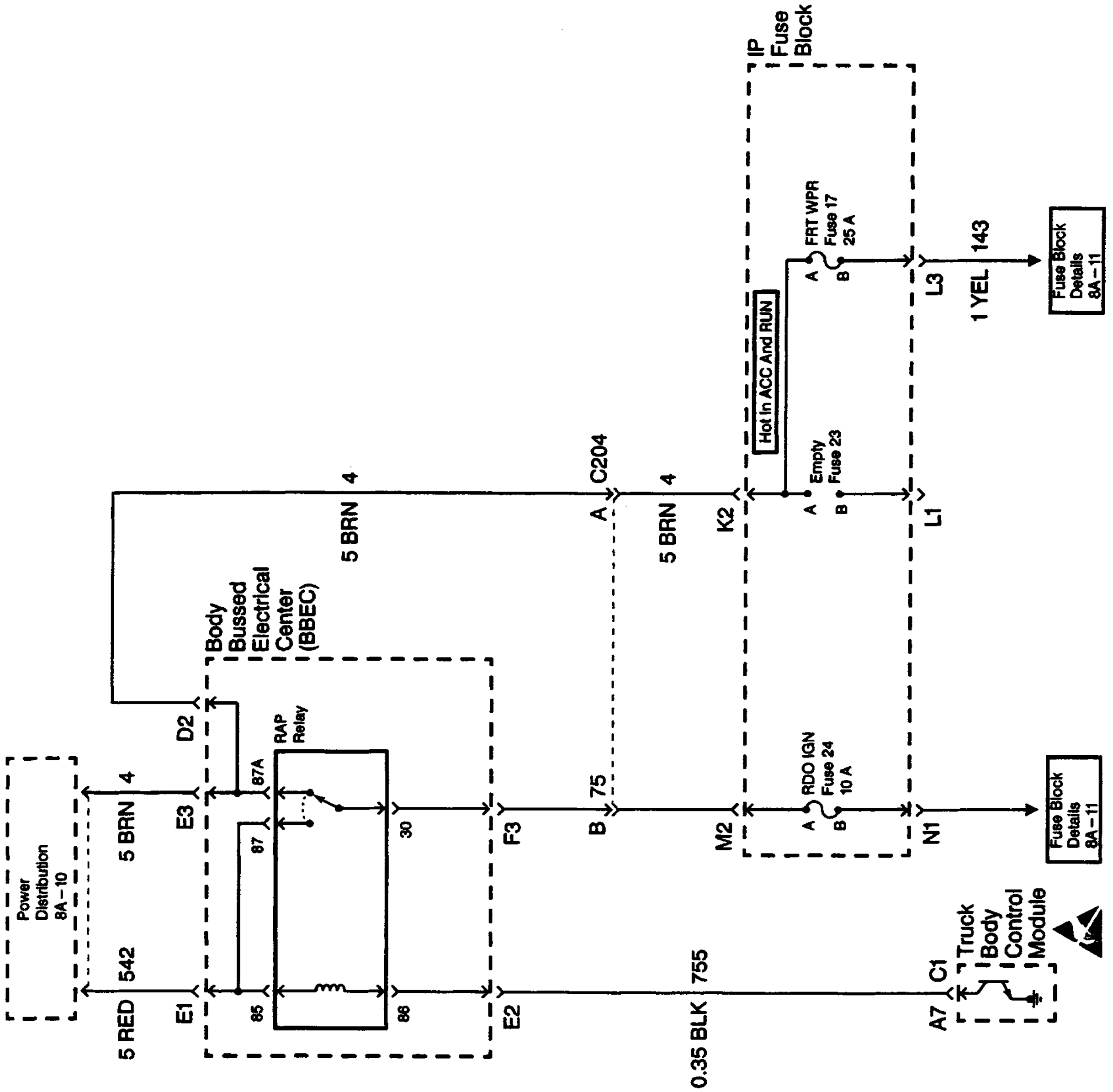

Underhood Bussed Electrical Center (UBEC)
A/C 10 A
FFH Relay
30
ECM B 20 A
Run 2 Relay
3
440
440
A8
C2
(Not used)
B8
(Not used)
241
A7
Accessory Power Control Module
1
Power Inverter Module
C1
26
Headlamp Ground Relay
1
Headlamp 15 A
Fog Lamp Relay
30
STOP LP 20 A
1540
C1
E2
P100
1540
0.8 ORN
Stoplamps Switch
B
Steering Column
Hazard Switch
Hot At All Times
HAZ LP 20 A
140
F12
0.8 ORN
140
C211
A4
140
1 ORN
B

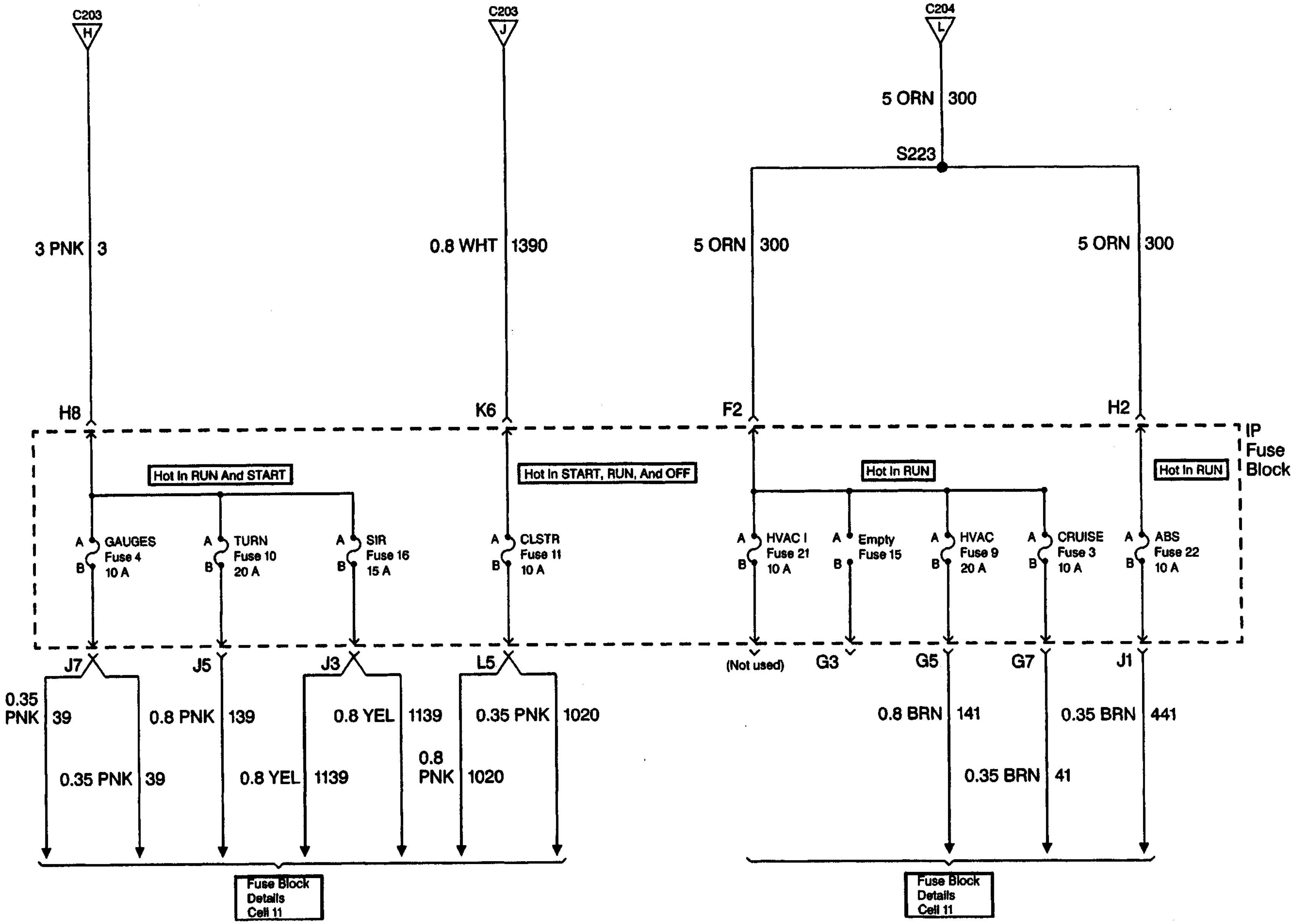

IP Fuse Block
C204
C
5 RED 642
S224
5 RED 642
D2
5 RED 642
B2
CIGAR LTR Fuse 2 15 A
A
B
E7
0.5 ORN 640
0.5 ORN 640
CTSY LP Fuse 8 15 A
E5
0.35 ORN 40
HTCM/VIM Fuse 14 10 A
E3
0.5 ORN 1740
Empty Fuse 20
E1 (Not used)
HDLP SW Fuse 1 10 A
C7
0.35 ORN 1940
BATT VLV/FFH Fuse 7 25 A
C5
0.8 ORN 840
PCM/BPM Fuse 13 10 A
C3
0.5 ORN 1040
RADIO BATT Fuse 19 10 A
C1
0.5 ORN 340
0.5 ORN 340
Fuse Block Details Cell 11
Fuse Block Details Cell 11


Ignition Switch
ACC
Lock
Off
Run
Start
C211
D
C211
F
C211
E
(Not used)
C6
C211
300
5 ORN
C204
C
300
5 ORN
L
S223
D6
4
5 BRN
K
RAP Relay
C1
1390
0.8 WHT
C203
B7
1390
0.8 WHT
J
IP Fuse Block
D1
(Not used)
3 PNK 3
F1
3 PNK 3
H
IP Fuse Block
C5
3 PNK 3
P100
G
UBEC

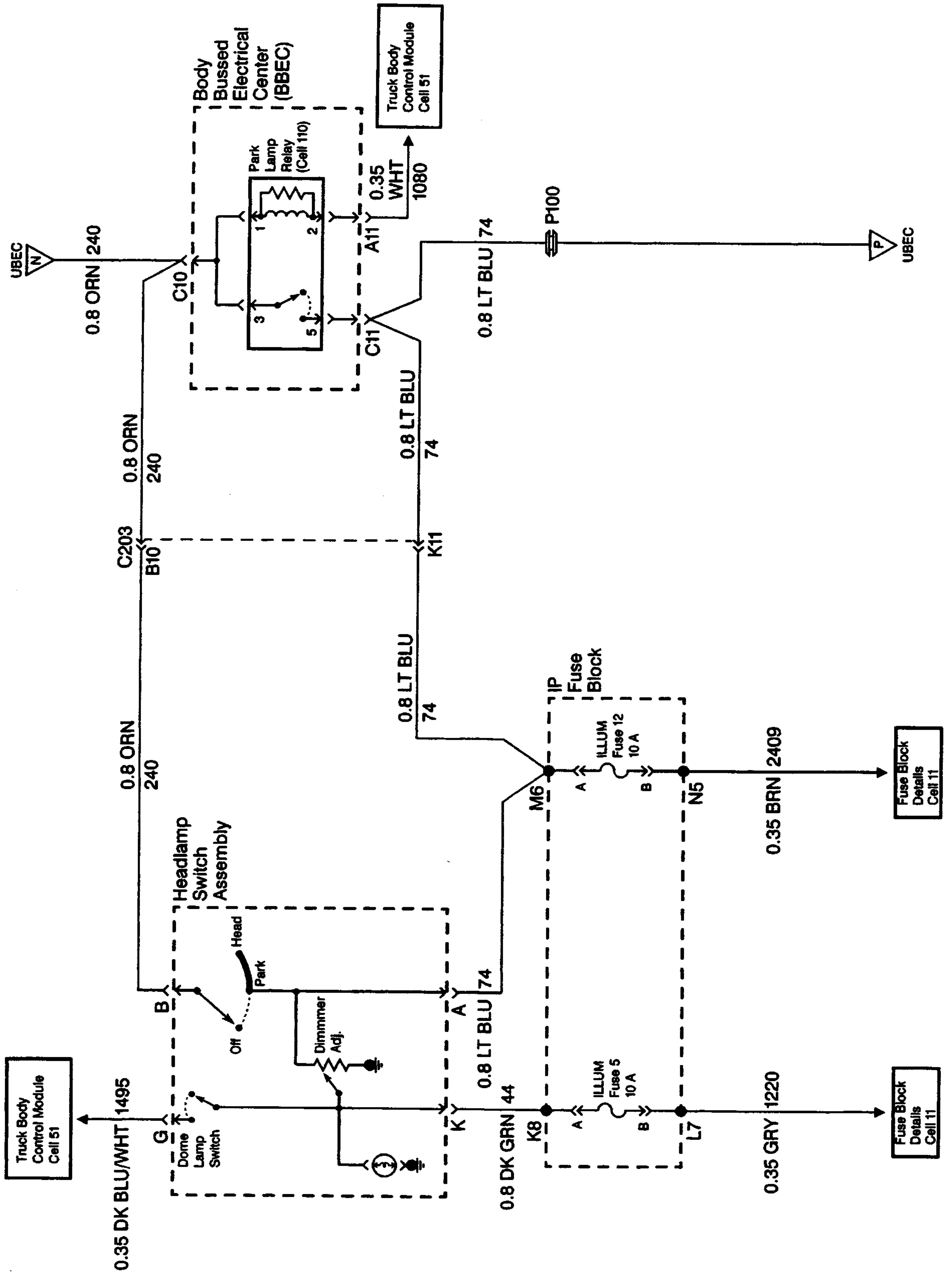

C211
G
3
3 PNK
Hot In RUN And START
Underhood Bussed Electrical Center (UBEC)
B
A
IGN E 10 A
85
Auxiliary Heater Relay
C1
D9
639
0.8 PNK
A
P/B Booster Vacuum Pump

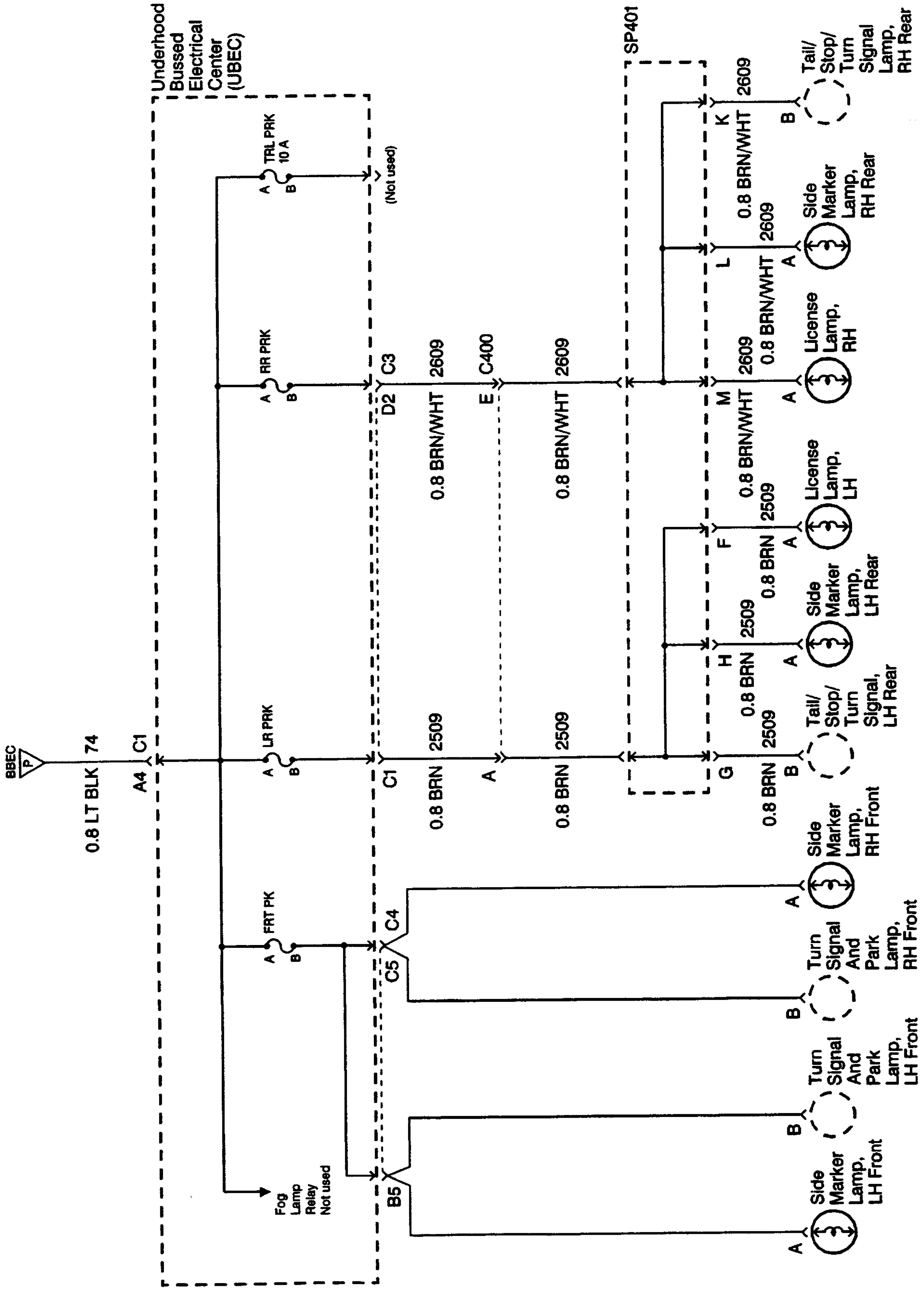
POWER DISTRIBUTION


IP Fuse Block
Hot In ACC And RUN
FRT WPR Fuse 17 25 A
A
B
143
1 YEL
L3
Fuse Block Details 8A-11
Empty Fuse 23
A
B
L1
K2
4
5 BRN
C204
A
B
75
4
5 BRN
Body Bussed Electrical Center (BBEC)
D2
RAP Relay
87A
87
30
85
86
E3
E1
F3
E2
Power Distribution 8A-10
4
5 BRN
542
5 RED
RDO IGN Fuse 24 10 A
A
B
M2
N1
Fuse Block Details 8A-11
755
0.35 BLK
C1
A7
Truck Body Control Module


C203
H
3 PNK
3
H8
C203
J
0.8 WHT
1390
K6
C204
L
5 ORN
300
S223
5 ORN
300
F2
5 ORN
300
H2
IP Fuse Block
Hot In RUN And START
Hot In START, RUN, And OFF
Hot In RUN
Hot In RUN
A
B
GAUGES Fuse 4 10 A
TURN Fuse 10 20 A
SIR Fuse 16 15 A
CLSTR Fuse 11 10 A
HVAC I Fuse 21 10 A
Empty Fuse 15
HVAC Fuse 9 20 A
CRUISE Fuse 3 10 A
ABS Fuse 22 10 A
J7
J5
J3
L5
(Not used)
G3
G5
G7
J1
0.35 PNK
39
0.35 PNK
39
0.8 PNK
139
0.8 YEL
1139
0.8 YEL
1139
0.35 PNK
1020
0.8 PNK
1020
0.8 BRN
141
0.35 BRN
41
0.35 BRN
441
Fuse Block Details Cell 11
Fuse Block Details Cell 11

POWER DISTRIBUTION


UBEC
N
0.8 ORN 240
C10
Body Bussed Electrical Center (BBEC)
Park Lamp Relay (Cell 110)
1
2
3
5
A11
0.35 WHT 1080
Truck Body Control Module Cell 51
C11
0.8 LT BLU 74
P100
P
UBEC
0.8 ORN 240
0.8 LT BLU 74
C203
B10
K11
0.8 ORN 240
0.8 LT BLU 74
IP Fuse Block
M6
A
ILLUM Fuse 12 10 A
B
N5
0.35 BRN 2409
Fuse Block Details Cell 11
Headlamp Switch Assembly
Head
Park
Off
B
A
74
0.8 LT BLU
Dimmmer Adj.
Truck Body Control Module Cell 51
1495
0.35 DK BLU/WHT
G
Dome Lamp Switch
K
44
0.8 DK GRN
K8
A
ILLUM Fuse 5 10 A
B
L7
1220
0.35 GRY
Fuse Block Details Cell 11


Underhood Bussed Electrical Center (UBEC)
BBEC
P
0.8 LT BLK
74
A4
C1
TRL PRK 10 A
A
B
(Not used)
RR PRK
LR PRK
FRT PK
Fog Lamp Relay Not used
C3
D2
2609
0.8 BRN/WHT
C400
E
C1
2509
0.8 BRN
A
C4
C5
B5
SP401
K
L
M
F
H
G
Tail/ Stop/ Turn Signal Lamp, RH Rear
Side Marker Lamp, RH Rear
License Lamp, RH
License Lamp, LH
Side Marker Lamp, LH Rear
Tail/ Stop/ Turn Signal, LH Rear
Side Marker Lamp, RH Front
Turn Signal And Park Lamp, RH Front
Turn Signal And Park Lamp, LH Front
Side Marker Lamp, LH Front

POWER DISTRIBUTION

Power Distribution Schematic Reference Table

Reference on Schematic	Location
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Headlamps: Daytime Running Lamps: 8A-102	8A-102-0
Interior Lights: 8A-114	8A-114-0
Interior Lights Dimming: 8A-117	8A-117-0

Power Distribution Schematic Icon Table

Icon	Icon Definition
▲	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Power Distribution Component Location Table

Name	Location	201-Pg	Fig.	Conn.
A/C Condenser Cooling Fan Buffer	Mounted to front of power electronics bay (PEB) bracket	9	10	31
Accessory Power Control Module (APM)	Mounted to the lower right bottom of the power electronics bay (PEB)	2	3	61
Auxiliary Battery	At right front corner of engine compartment	1	2	
Auxiliary Heater (FFH) Relay	RH rear of engine compartment			
Battery Pack Air Flow Sensor	Inside battery thermal module	29	30	2
Battery Thermal Module (see Battery Pack Blower Assembly)	Mounted to the front of the battery pack, below the cab	0	1	25
Blower Motor Relay	RH rear of engine compartment	24	25	38
Body Bussed Electrical Center	Behind center of IP			78
Electronic Brake Control Module (EBCM) C3	Forward lamps harness to electronic brake control module (EBCM)	14	15	7
Headlamp Ground Relay	In underhood bussed electrical center (UBEC)			
Headlamp Power Relay	In underhood bussed electrical center (UBEC)			
Headlamp Switch	Left of steering wheel, in IP	34	35	54
Horn Relay	In underhood bused electrical center	45	46	35
Horn, LH	in LH fender behind washer bottle	4	5	11
Horn, RH	In RH fender near auxiliary battery	4	5	12

Name	Location	201-Pg	Fig.	Conn.
Ignition Switch	On steering column, under column trim panel	39	40	
IP Fuse Block	LH side of instrument panel	33	34	76
IP Lamp Dimmer Switch	Part of head lamp switch	34	35	
License Lamp, LH	Left center of rear bumper	59	60	14
License Lamp, RH	Right center of rear bumper	59	60	14
P/B Booster Vacuum Pump	Behind PEB mounted to PEB bracket	2	6	15
Park Lamp Relay	In body bussed electrical center (BBEC)			
Park/Turn Signal Lamp, LH Front	Left front corner of front bumper	4	5	28
Park/Turn Signal Lamp, RH Front	Right front corner of front bumper	4	5	29
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Retained Accessory Power Relay	In the body bussed electrical center (BBEC)			
Run 2 Relay	In relay center	45	46	41
Side Marker Lamp, LH Front	Left front corner of vehicle	54	55	17
Side Marker Lamp, LH Rear	Left rear corner of vehicle	52	53	17
Side Marker Lamp, RH Front	Right front corner of vehicle	54	55	18
Side Marker Lamp, RH Rear	Right rear corner of vehicle	52	53	18
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
Tail/Stop/Turn Signal Lamp, LH Rear	Left rear corner of vehicle	52	53	29
Tail/Stop/Turn Signal Lamp, RH Rear	Right rear corner of vehicle	52	53	30
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C3	At UBEC	53	54	72
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
Underhood Bussed Electrical Center (UBEC)—C5	At UBEC	53	54	20
Underhood Bussed Electrical Center (UBEC)—C6	At UBEC			20
C102				
C103	Chassis harness to propulsion harness, near battery junction block			99
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C204	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	89

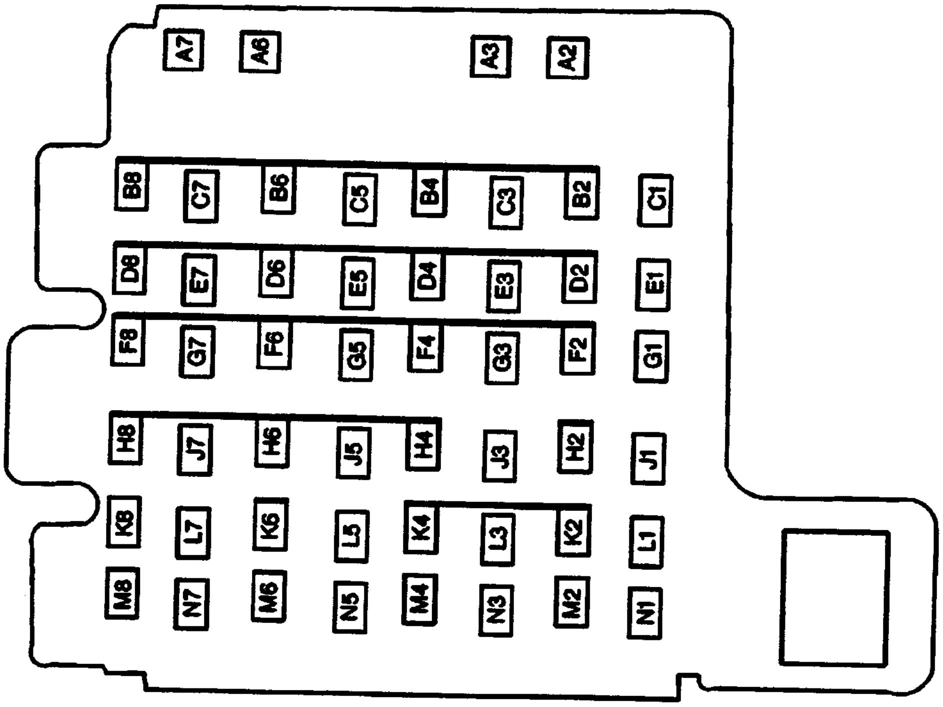
POWER DISTRIBUTION

Name	Location	201-Pg	Fig.	Conn.
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C400	Tail and stoplamps harness to chassis harness, under vehicle, at left rear of frame	66	67	95
P100	Below brake master cylinder at bulkhead	25	26	
S223	In I/P harness run channel between I/P fuse block and C204 (body harness), 8cm from C204			
S224	In I/P harness run channel between I/P fuse block and C204 (body harness), 12cm from C204			
SP401	Mounted to left rear frame rail	66	67	

BLANK

FUSE BLOCK DETAILS

IP Fuse Block Detail


A7
A6
A3
A2
B8
C7
B6
C5
B4
C3
B2
C1
D8
E7
D6
E5
D4
E3
D2
E1
F8
G7
F6
G5
F4
G3
F2
G1
H8
J7
H6
J5
H4
J3
H2
J1
K8
L7
K6
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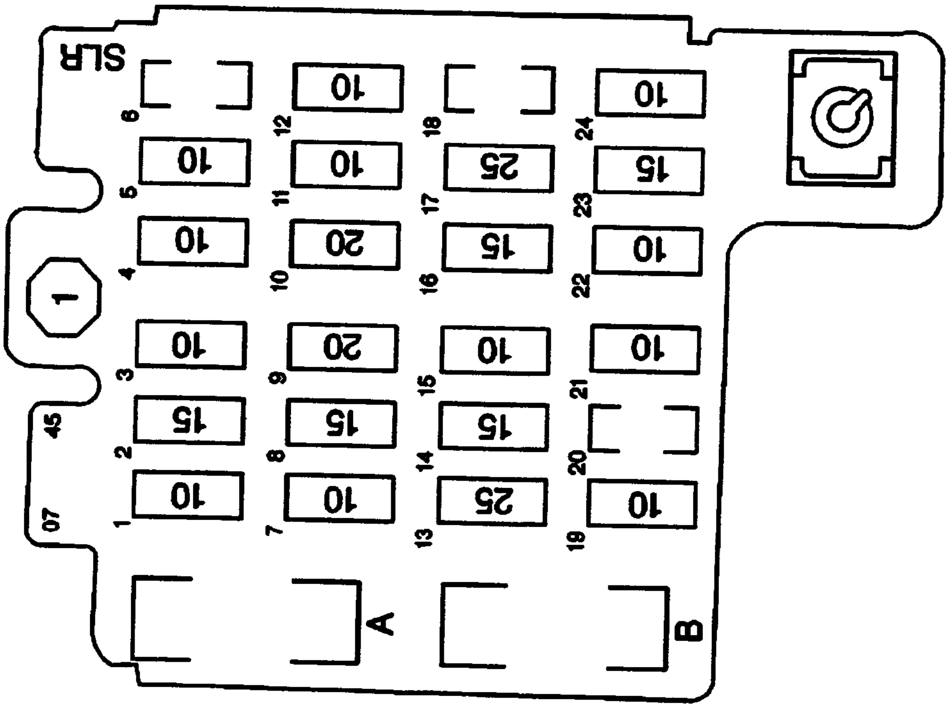
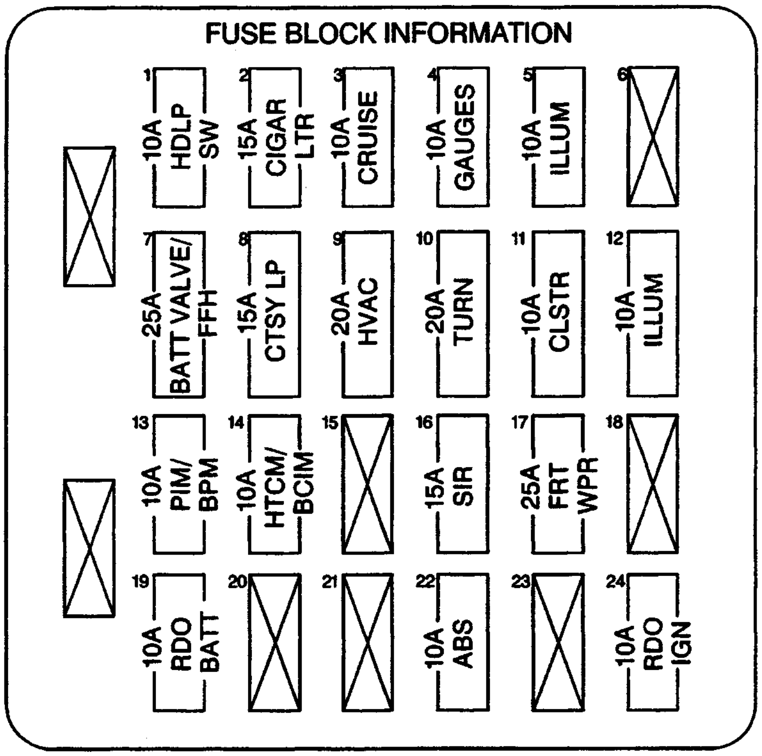
K4
L3
K2
L1
M8
N7
M6
N5
M4
N3
M2
N1


SLR
6
10
12
18
10
24
10
5
10
11
25
17
15
23
10
4
20
10
15
16
10
22
1
10
3
20
9
10
15
10
21
45
15
2
15
8
15
14
20
10
07
1
10
7
25
13
10
19
A
B

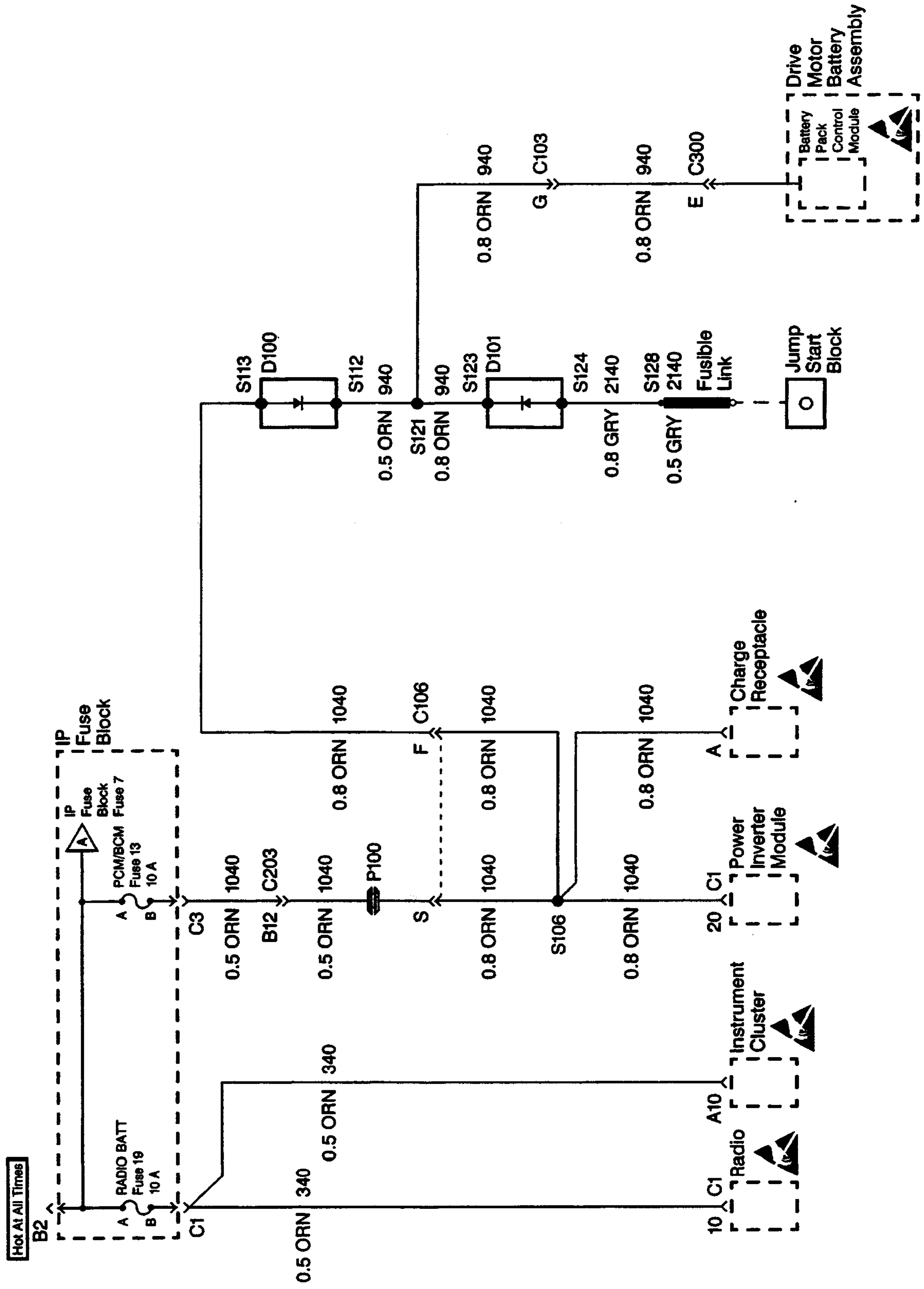

FUSE BLOCK INFORMATION
1 10A HDLP SW
2 15A CIGAR LTR
3 10A CRUISE
4 10A GAUGES
5 10A ILLUM
6
7 25A BATT VALVE/ FFH
8 15A CTSY LP
9 20A HVAC
10 20A TURN
11 10A CLSTR
12 10A ILLUM
13 10A PIM/ BPM
14 10A HTCM/ BCIM
15
16 15A SIR
17 25A FRT WPR
18
19 10A RDO BATT
20
21
22 10A ABS
23
24 10A RDO IGN

Fuse/Circuit Breaker	Rating	Description
HDLP SW/Fuse 1	10A	Headlamp Switch
CIGAR LTR/Fuse 2	15A	Cigar Lighter, Data Link Connector
CRUISE/Fuse 3	10A	Truck Body Control Module (TBC), Cruise Control Switch
GAUGES/Fuse 4	10A	Instrument Cluster, HTCM, Truck Body Control Module (TBC), BTSI Actuator, Auxiliary Heater Service Port
ILLUM/Fuse 5	10A	Auxiliary Heater Switch, Radio, IP Module Switch, Truck Body Control Module (TBC), Instrument Cluster
NOT USED/Fuse 6		
BATT VAVLE/FFH/Fuse 7	25A	Transmission Range Indicator Switch, Auxiliary Heater, Refrigerant Reversing Valve, Battery Valve Primary Relay, Battery Valve Secondary Relay, Secondary Battery Vavle, Coolant Pump Buffer
CTSY LP/Fuse 8	15A	Courtesy Lamp, LH, Courtesy Lamp, RH, Inadvertant Power Relay, Dome and High Mounted Stop Lamp
HVAC/Fuse 9	20A	Heater, Ventilation, and A/C Controller (HVAC)
TURN/Fuse 10	20A	Turn Signal Switch
CLSTR/Fuse 11	10A	Instrument Cluster, Body Control Interface Module, HTCM, Battery Pack Control Module, Power Inverter Module
ILLUM/Fuse 12	10A	Ashtray Lamp, Truck Body Control Module (TBC)
PIM/BPM/Fuse 13	10A	Power Inverter Module, Charge Receptacle, Battery Pack Control Module
HTCM/BCIM/Fuse 14	10A	Body Control Interface Module, HTCM
NOT USED/Fuse 15		

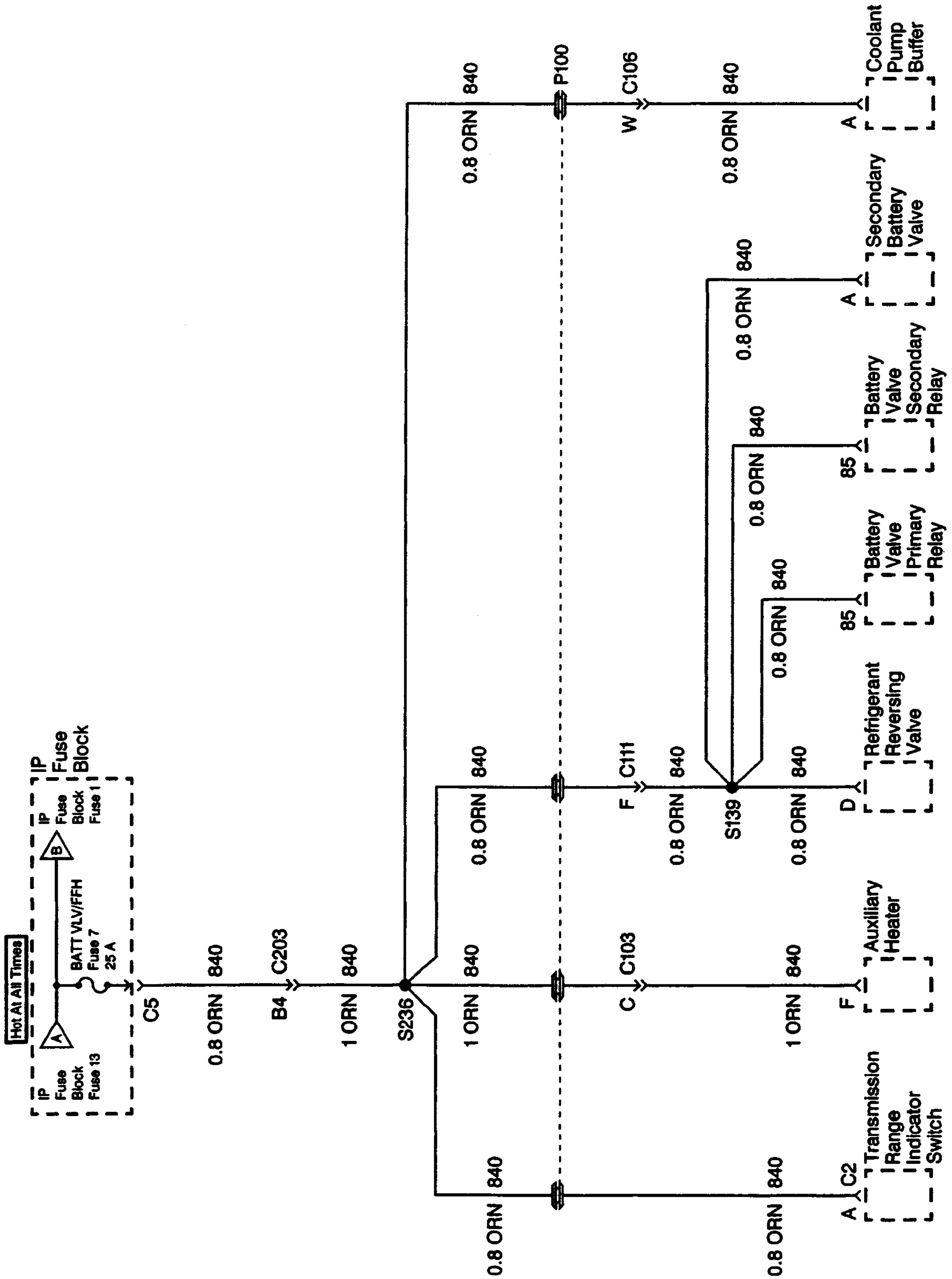
FUSE BLOCK DETAILS

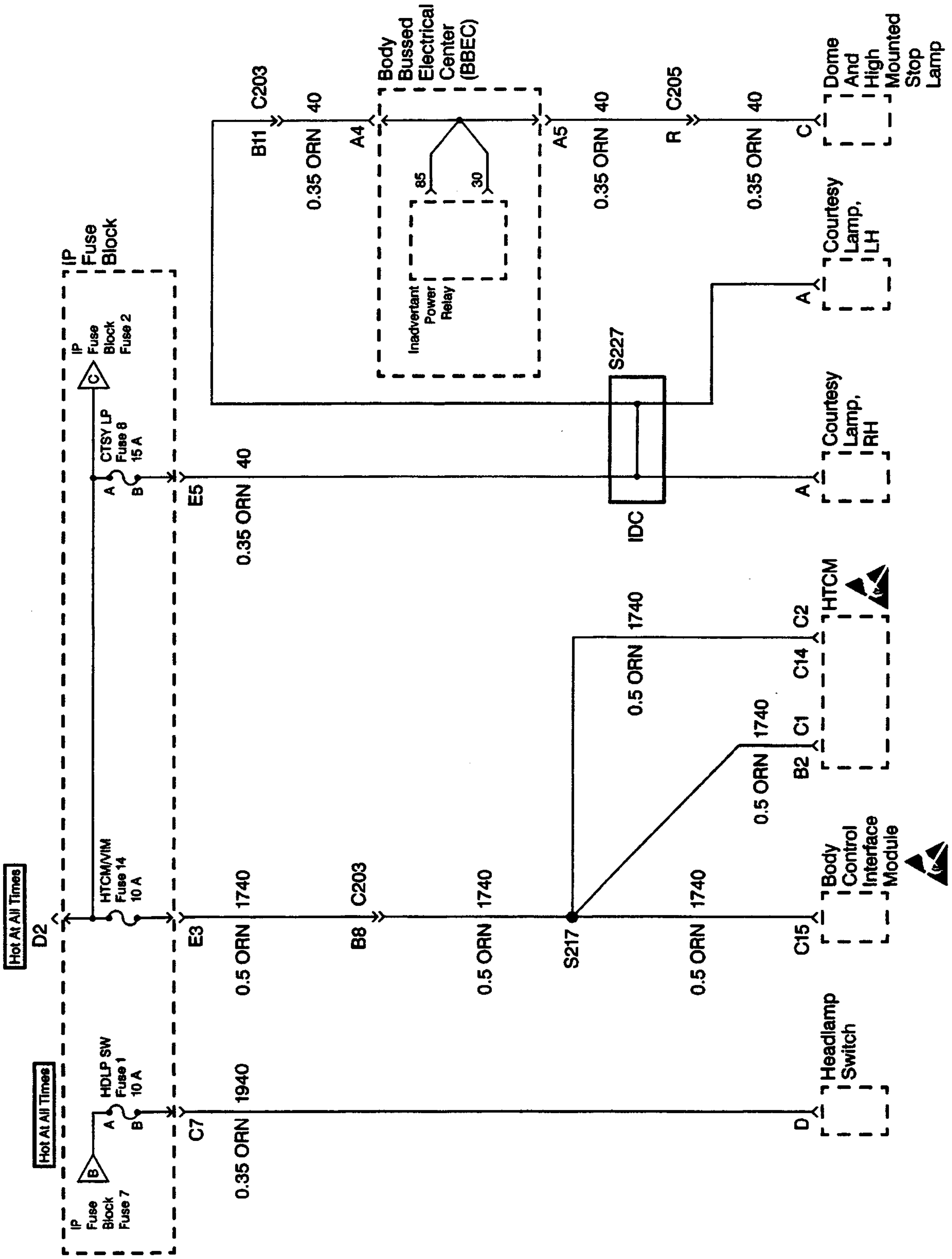
IP Fuse Block Detail

Fuse/Circuit Breaker	Rating	Description
SIR/Fuse 16	15A	I/P Module Switch, Supplemental Restraint Sensing and Diagnostic Module
FRT WPR/Fuse 17	25A	Windshield Wiper Motor, Windshield Wiper/Washer Control Switch
NOT USED/Fuse 18		
RDO BATT/Fuse 19	10A	Radio, Instrument Cluster
NOT USED/Fuse 20		
NOT USED/Fuse 21		
ABS/Fuse 22	10A	Stop Lamp Switch, Electronic Brake Control Module Assembly
NOT USED/Fuse 23		
RDO IGN/Fuse 24	10A	Radio

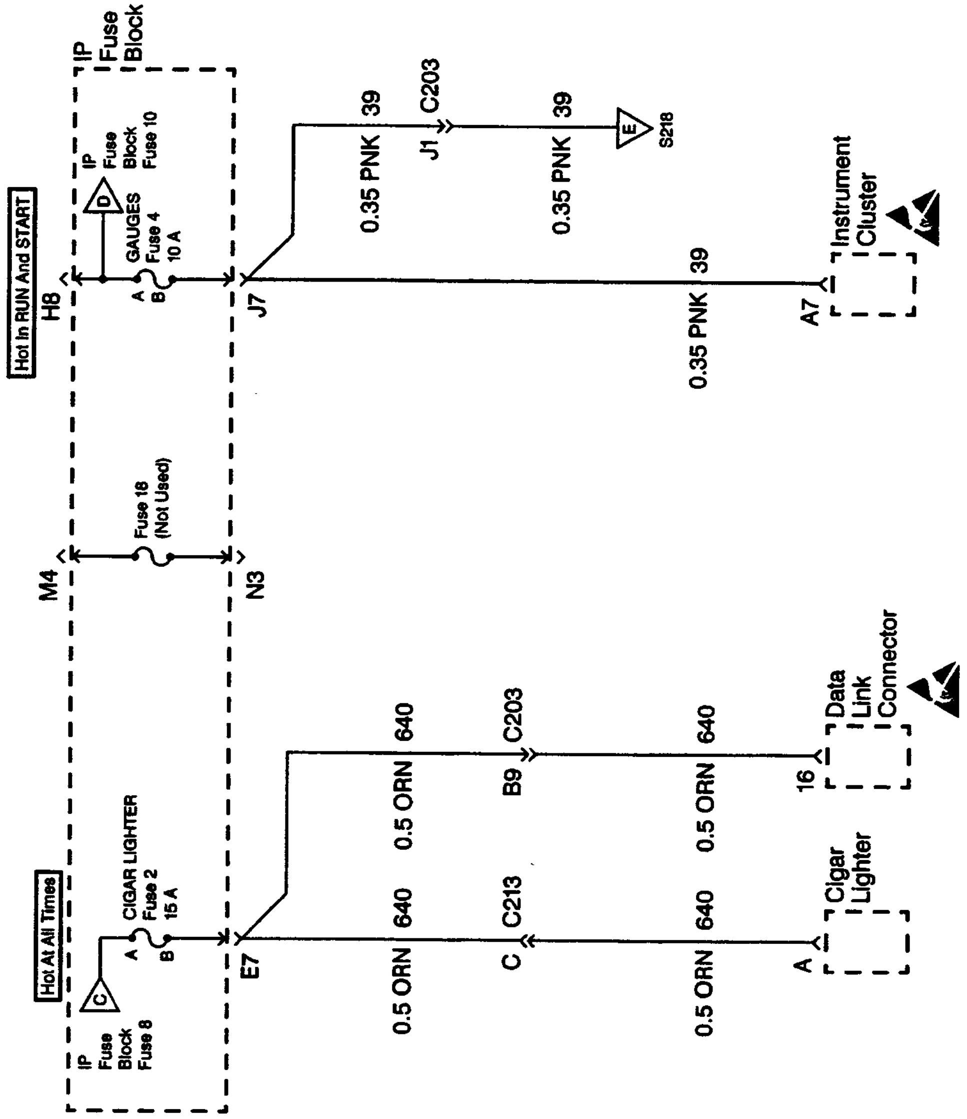

Hot At All Times
B2
IP Fuse Block
RADIO BATT Fuse 19 10 A
PCM/BCM Fuse 13 10 A
IP Fuse Block Fuse 7
A
B
A
B
C1
C3
0.5 ORN 340
0.5 ORN 340
0.5 ORN 1040
B12 C203
0.5 ORN 1040
P100
S
0.8 ORN 1040
S106
0.8 ORN 1040
F C106
0.8 ORN 1040
0.8 ORN 1040
0.8 ORN 1040
10 C1
Radio
A10
Instrument Cluster
20 C1
Power Inverter Module
A
Charge Receptacle
S113
D100
S112
0.5 ORN 940
S121
0.8 ORN 940
S123
D101
S124
0.8 GRY 2140
S128
0.5 GRY 2140
Fusible Link
Jump Start Block
0.8 ORN 940
G C103
0.8 ORN 940
E C300
Battery Pack Control Module
Drive Motor Battery Assembly

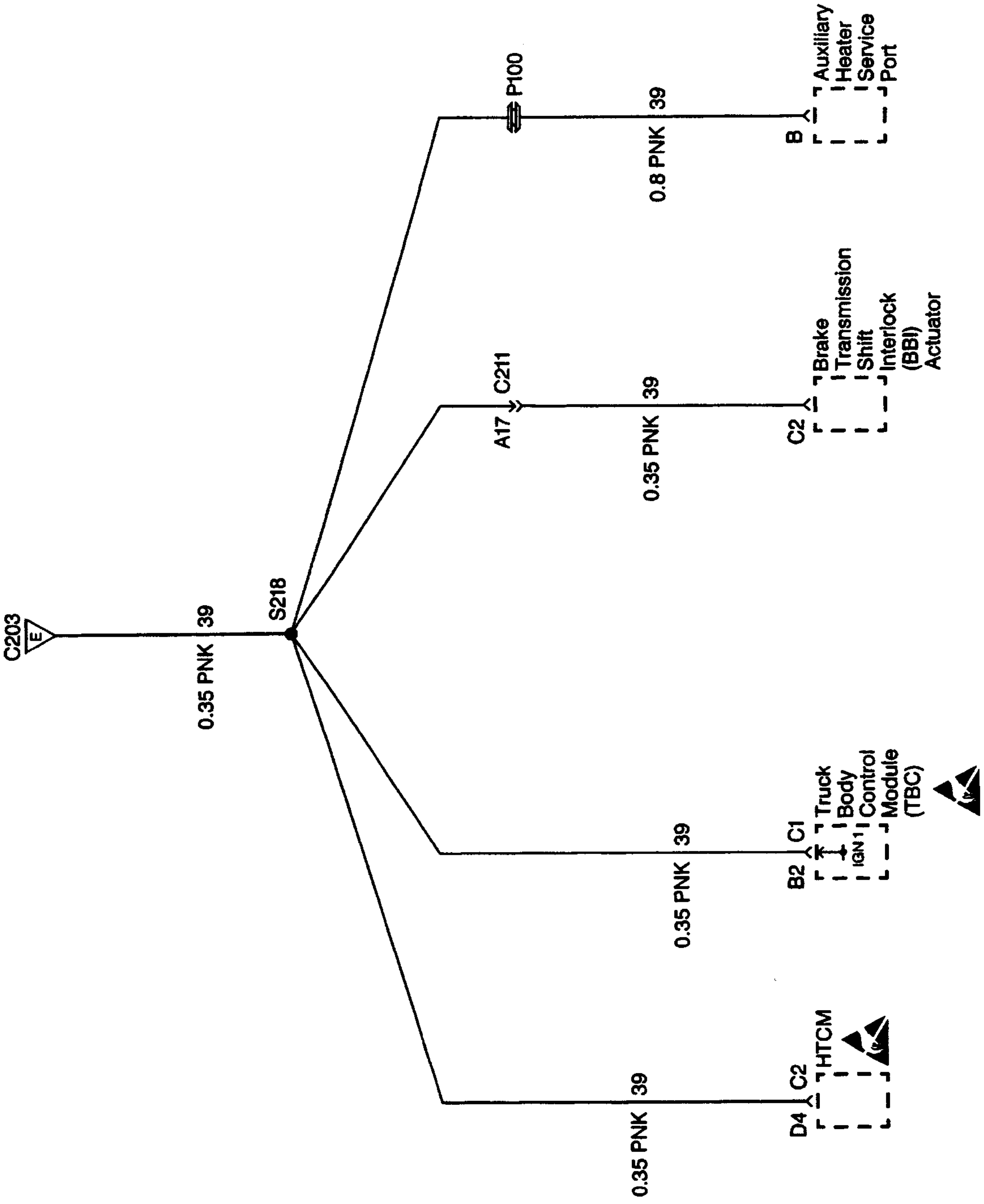
FUSE BLOCK DETAILS


Hot At All Times
IP Fuse Block Fuse 13
A
BATT VLV/FFH Fuse 7 25 A
B
IP Fuse Block Fuse 1
IP Fuse Block
C5
0.8 ORN 840
B4 C203
1 ORN 840
S236
0.8 ORN 840
P100
W C106
0.8 ORN 840
A
Coolant Pump Buffer
0.8 ORN 840
A
Secondary Battery Valve
0.8 ORN 840
85
Battery Valve Secondary Relay
0.8 ORN 840
85
Battery Valve Primary Relay
0.8 ORN 840
F C111
0.8 ORN 840
S139
0.8 ORN 840
D
Refrigerant Reversing Valve
1 ORN 840
C C103
1 ORN 840
F
Auxiliary Heater
0.8 ORN 840
0.8 ORN 840
A C2
Transmission Range Indicator Switch

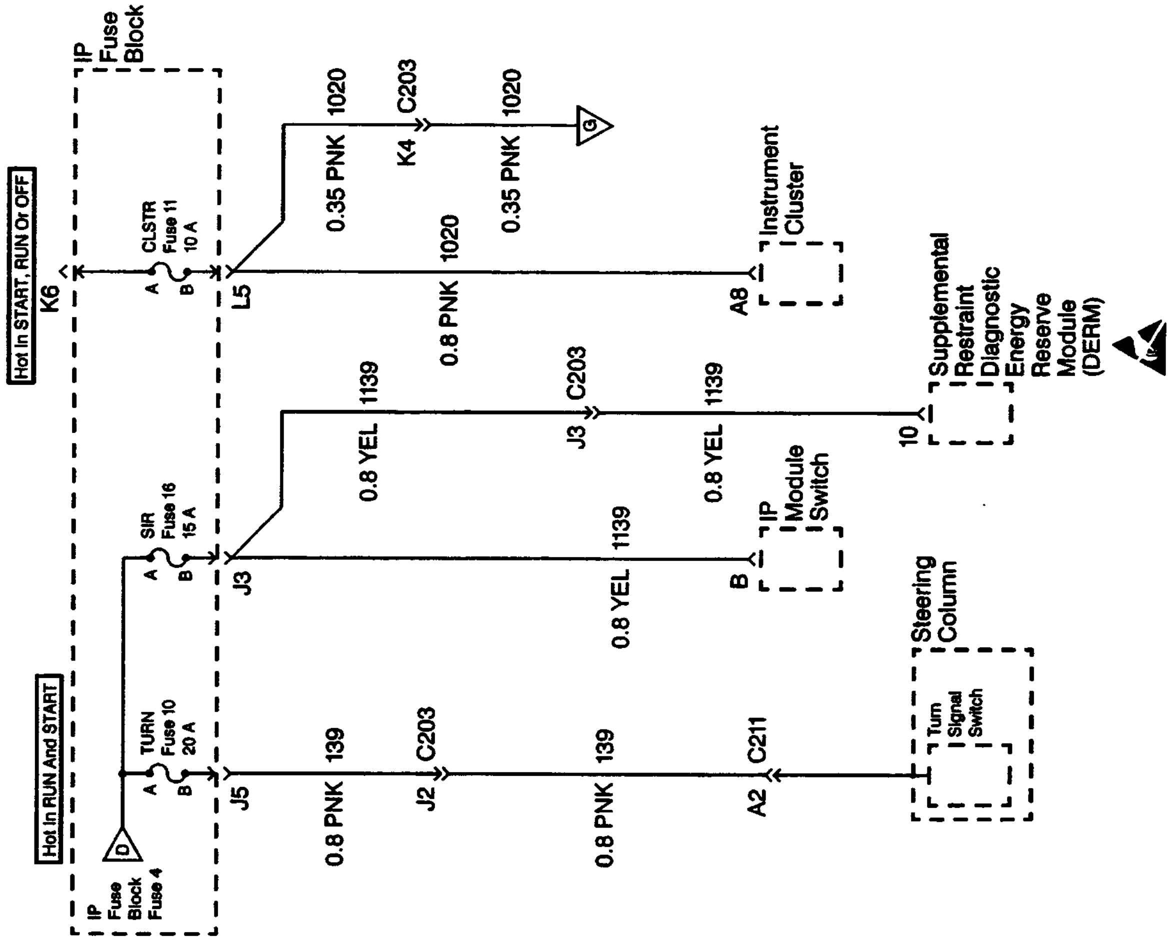

Hot At All Times
Hot At All Times
IP Fuse Block
IP Fuse Block Fuse 7
B
HDLP SW Fuse 1 10 A
A
B
C7
0.35 ORN 1940
D
Headlamp Switch
D2
HTCM/VIM Fuse 14 10 A
E3
0.5 ORN 1740
B8
C203
0.5 ORN 1740
S217
0.5 ORN 1740
C15
Body Control Interface Module
0.5 ORN 1740
B2
C1
0.5 ORN 1740
C2
C14
HTCM
IP Fuse Block Fuse 2
C
CTSY LP Fuse 8 15 A
A
B
E5
0.35 ORN 40
IDC
S227
A
Courtesy Lamp, RH
A
Courtesy Lamp, LH
B11
C203
0.35 ORN 40
A4
Body Bussed Electrical Center (BBEC)
Inadvertant Power Relay
85
30
A5
0.35 ORN 40
R
C205
0.35 ORN 40
C
Dome And High Mounted Stop Lamp

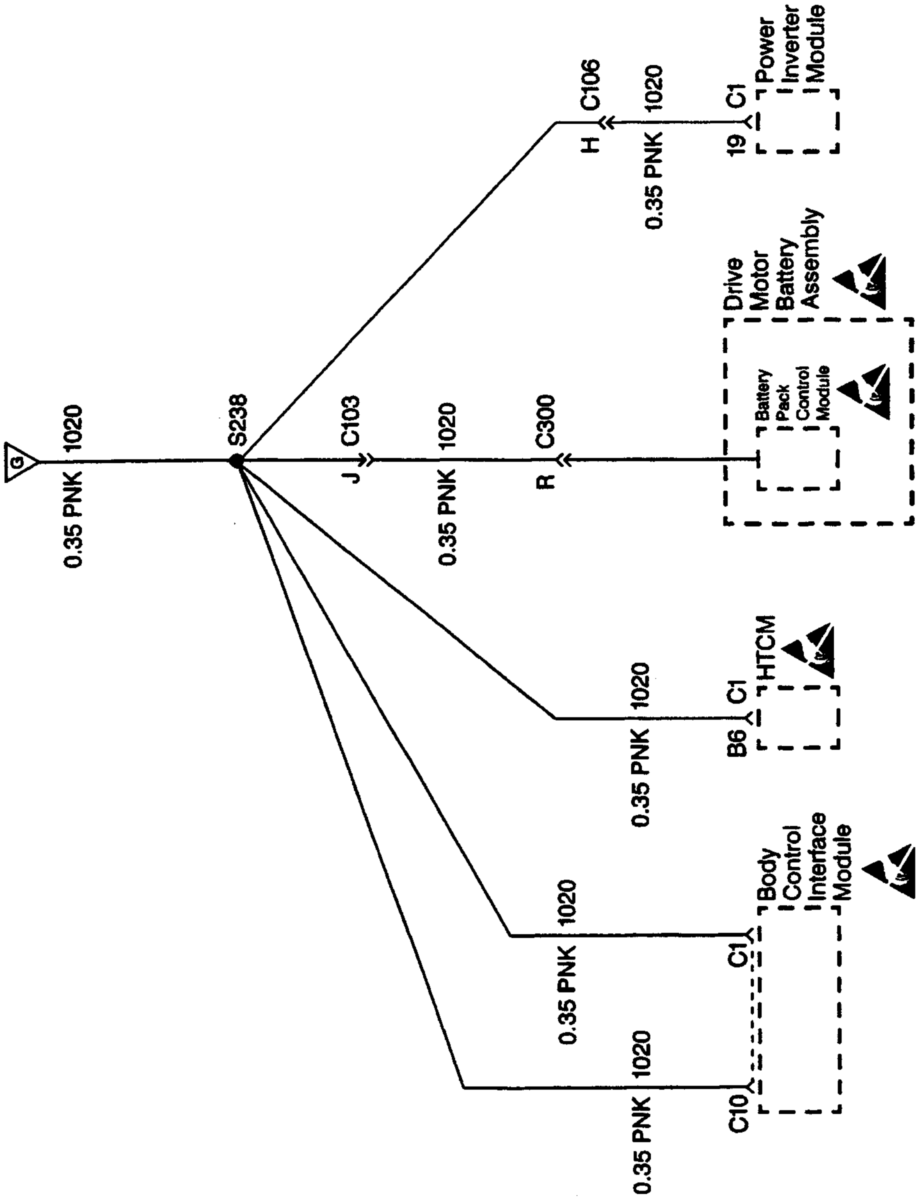
FUSE BLOCK DETAILS


Hot In RUN And START
H8
IP Fuse Block Fuse 10
D
GAUGES Fuse 4 10 A
A
B
J7
IP Fuse Block
0.35 PNK 39
C203
J1
0.35 PNK 39
E
S218
0.35 PNK 39
A7
Instrument Cluster
M4
Fuse 18 (Not Used)
N3
Hot At All Times
IP Fuse Block Fuse 8
C
CIGAR LIGHTER Fuse 2 15 A
A
B
E7
0.5 ORN 640
C203
B9
0.5 ORN 640
16
Data Link Connector
0.5 ORN 640
C213
C
0.5 ORN 640
A
Cigar Lighter

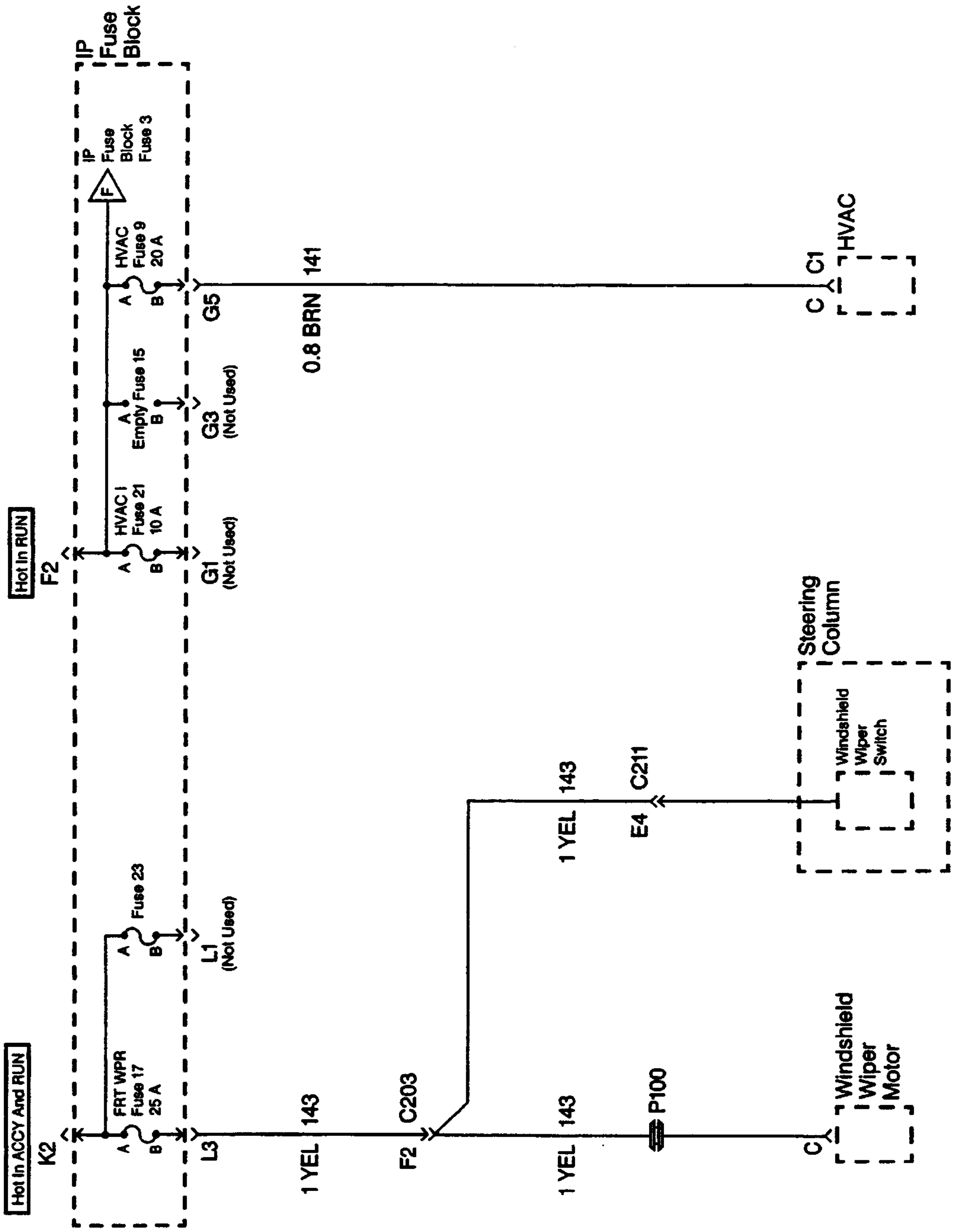

C203
E
0.35 PNK
39
S218
P100
0.8 PNK
39
B
Auxiliary Heater Service Port
C211
A17
0.35 PNK
39
C2
Brake Transmission Shift Interlock (BBI) Actuator
0.35 PNK
39
C1
B2
IGN1
Truck Body Control Module (TBC)
0.35 PNK
39
C2
D4
HTCM

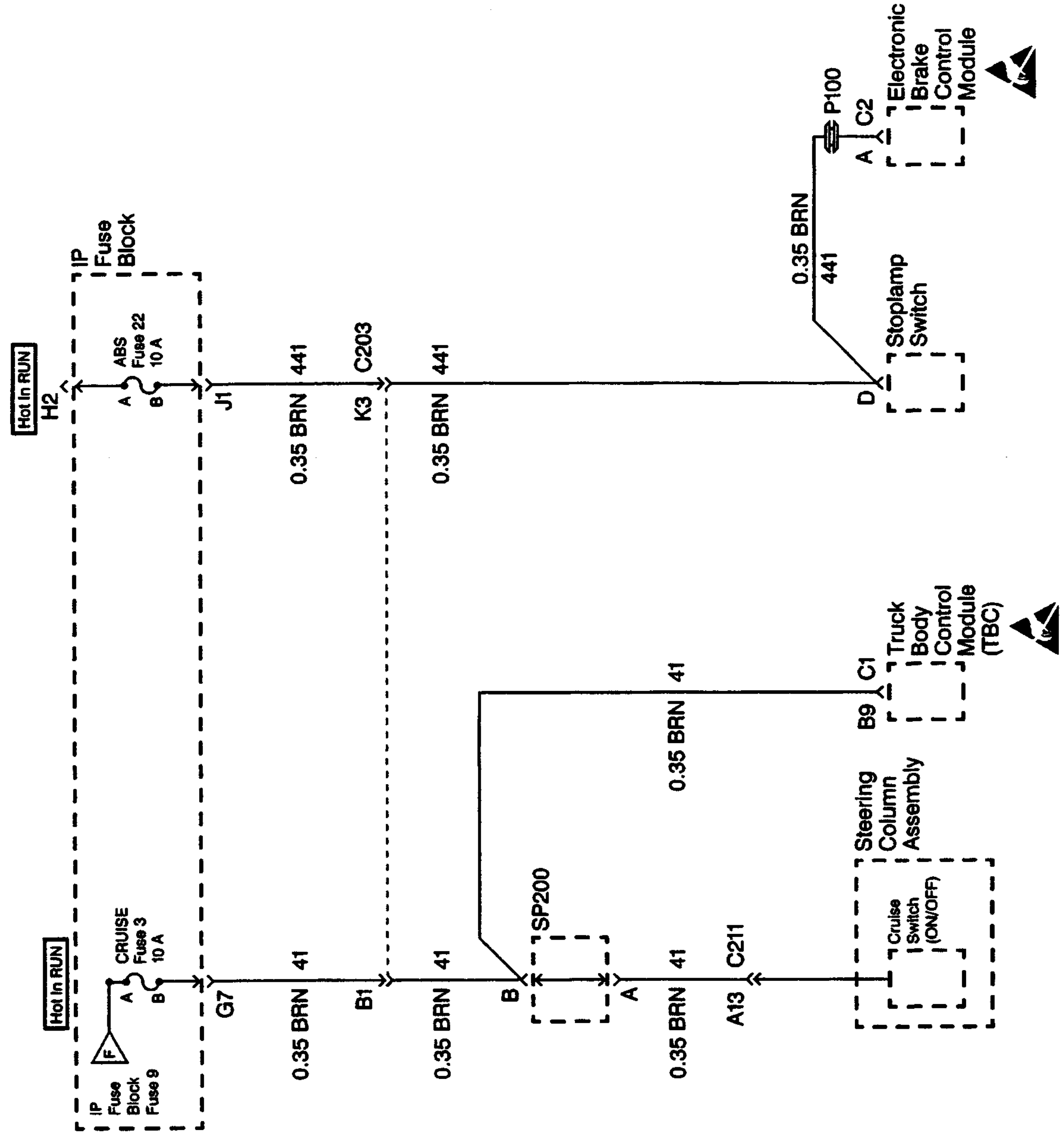
FUSE BLOCK DETAILS


Hot In START, RUN Or OFF
Hot In RUN And START
IP Fuse Block
IP Fuse Block Fuse 4
D
K6
CLSTR Fuse 11 10 A
SIR Fuse 16 15 A
TURN Fuse 10 20 A
A
B
L5
J3
J5
0.35 PNK 1020
K4 C203
0.35 PNK 1020
G
0.8 PNK 1020
A8
Instrument Cluster
0.8 YEL 1139
J3 C203
0.8 YEL 1139
10
Supplemental Restraint Diagnostic Energy Reserve Module (DERM)
0.8 YEL 1139
B
IP Module Switch
0.8 PNK 139
J2 C203
0.8 PNK 139
A2 C211
Steering Column
Turn Signal Switch

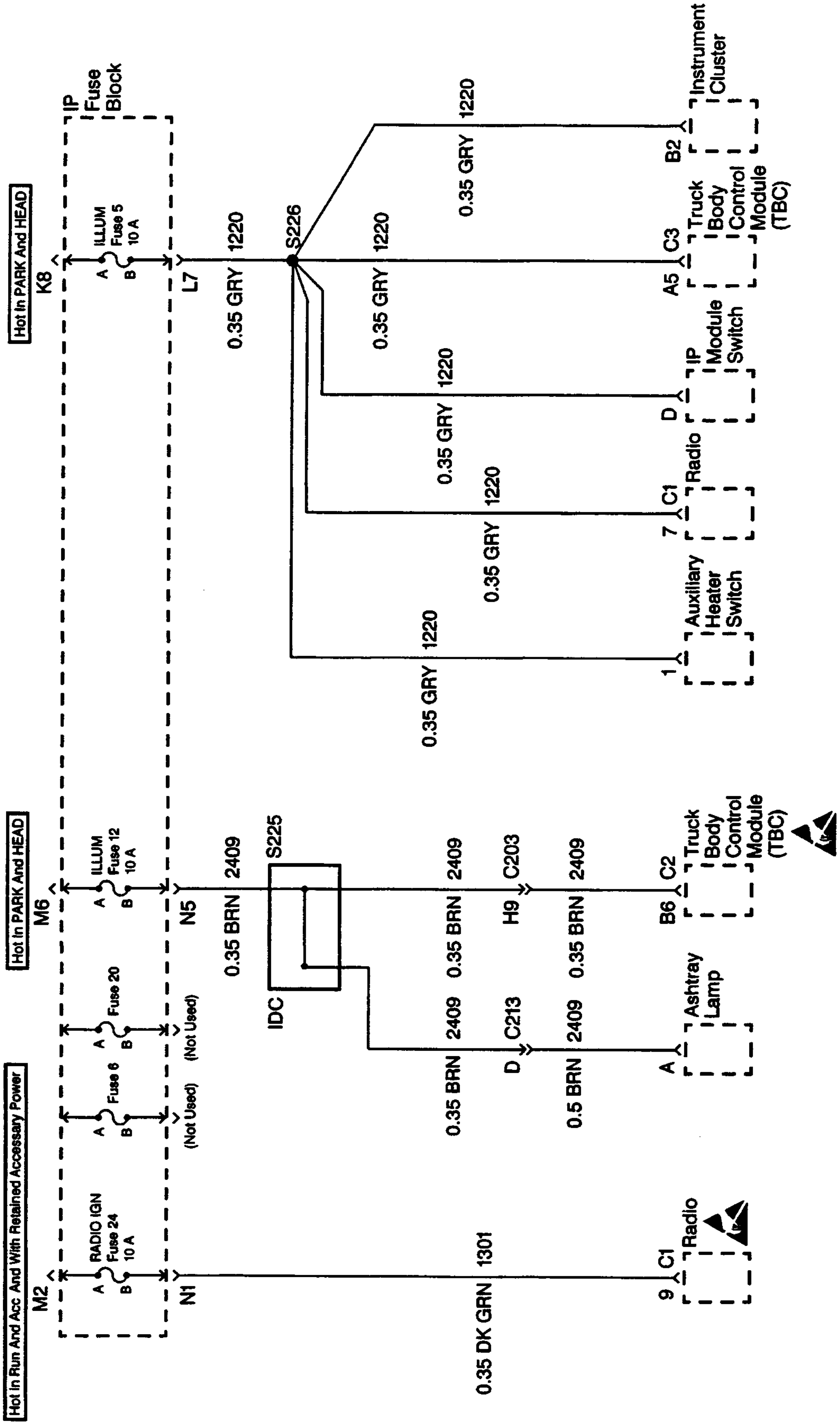

G
0.35 PNK 1020
S238
J C103
0.35 PNK 1020
R C300
Battery Pack Control Module
Drive Motor Battery Assembly
H C106
0.35 PNK 1020
19 C1
Power Inverter Module
0.35 PNK 1020
B6 C1
HTCM
0.35 PNK 1020
C1
0.35 PNK 1020
C10
Body Control Interface Module

FUSE BLOCK DETAILS


IP Fuse Block
IP Fuse Block Fuse 3
F
HVAC Fuse 9 20 A
Empty Fuse 15
HVAC I Fuse 21 10 A
Hot In RUN
F2
A
B
G5
G3 (Not Used)
G1 (Not Used)
0.8 BRN 141
C C1
HVAC
Fuse 23
L1 (Not Used)
Hot In ACCY And RUN
K2
FRT WPR Fuse 17 25 A
L3
1 YEL 143
F2 C203
E4 C211
P100
Steering Column
Windshield Wiper Switch
Windshield Wiper Motor
C


Hot In RUN
H2
IP Fuse Block
ABS Fuse 22 10 A
A
B
J1
0.35 BRN
441
C203
K3
0.35 BRN
441
D
Stoplamp Switch
0.35 BRN
441
P100
A
C2
Electronic Brake Control Module
Hot In RUN
IP Fuse Block Fuse 9
F
CRUISE Fuse 3 10 A
A
B
G7
0.35 BRN
41
B1
0.35 BRN
41
B
SP200
A
0.35 BRN
41
C211
A13
Steering Column Assembly
Cruise Switch (ON/OFF)
0.35 BRN
41
B9
C1
Truck Body Control Module (TBC)

FUSE BLOCK DETAILS


Hot In PARK And HEAD
K8
ILLUM Fuse 5 10 A
A
B
L7
IP Fuse Block
0.35 GRY 1220
S226
0.35 GRY 1220
C3
A5
Truck Body Control Module (TBC)
0.35 GRY 1220
B2
Instrument Cluster
0.35 GRY 1220
D
IP Module Switch
0.35 GRY 1220
C1
7
Radio
0.35 GRY 1220
1
Auxiliary Heater Switch
Hot In PARK And HEAD
M6
ILLUM Fuse 12 10 A
N5
0.35 BRN 2409
S225
IDC
0.35 BRN 2409
C203
H9
0.35 BRN 2409
C2
B6
Truck Body Control Module (TBC)
Fuse 20
(Not Used)
0.35 BRN 2409
C213
D
0.5 BRN 2409
A
Ashtray Lamp
Hot In Run And Acc And With Retained Accessory Power
Fuse 6
(Not Used)
M2
RADIO IGN Fuse 24 10 A
N1
0.35 DK GRN 1301
C1
9
Radio

Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Interior Lighting: 8A-114	8A-114-0

Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Fuse Block Details Component Location Table

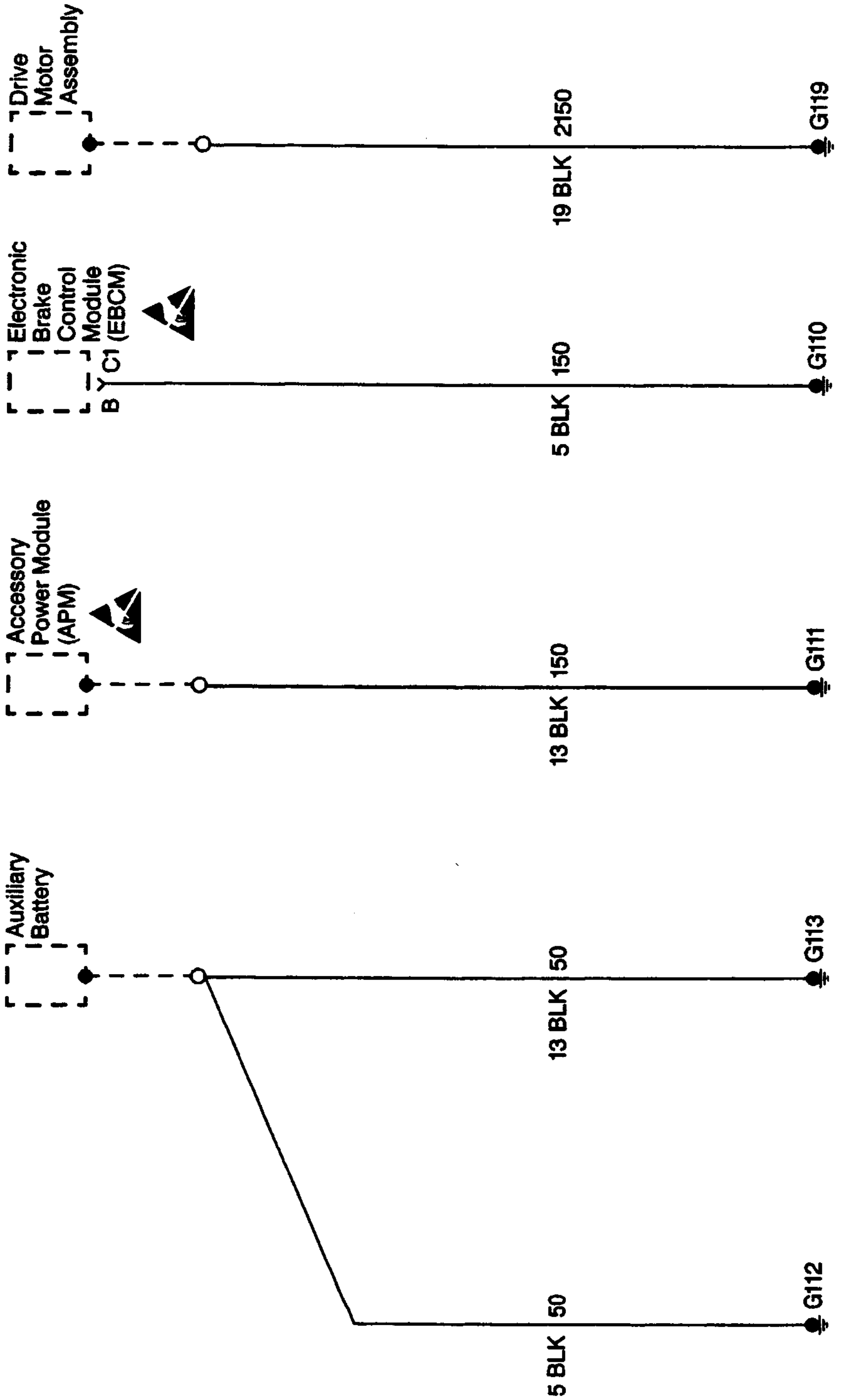
Name	Location	201-Pg	Fig.	Conn.
Ashtray Lamp	Above ashtray	44	45	1
Auxiliary Heater (FFH)	Mounted under truck, in front of battery pack assembly, between frame rails	28	29	37
Auxiliary Heater (FFH) Service Port	RH side of engine compartment, near blower motor	25	26	1
Auxiliary Heater (FFH) Switch	Left of steering column in IP			31
Battery Pack Control Module	Inside drive motor battery pack assembly			
Battery Valve Primary Relay	Mounted to bracket at passenger side rear of engine compartment			32
Battery Valve Secondary Relay	Mounted to the front of the battery pack, below the cab			32
Body Bussed Electrical Center	Behind center of IP			78
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67
Brake Transmission Shift Interlock (BTSI) Actuator	On steering column above knee bolster	39	40	3
Charge Receptacle	Behind front license plate	0	1	50
Cigar Lighter	Lower center of IP			
Coolant Pump Buffer	On coolant pump bracket above front crossmember	5	6	33
Courtesy Lamp, LH	Below LH side of IP			4
Courtesy Lamp, RH	Below LH side of IP	41	42	5
Cruise Control Switch (Part of Multifunction Switch)	Part of multifunction switch on steering column			

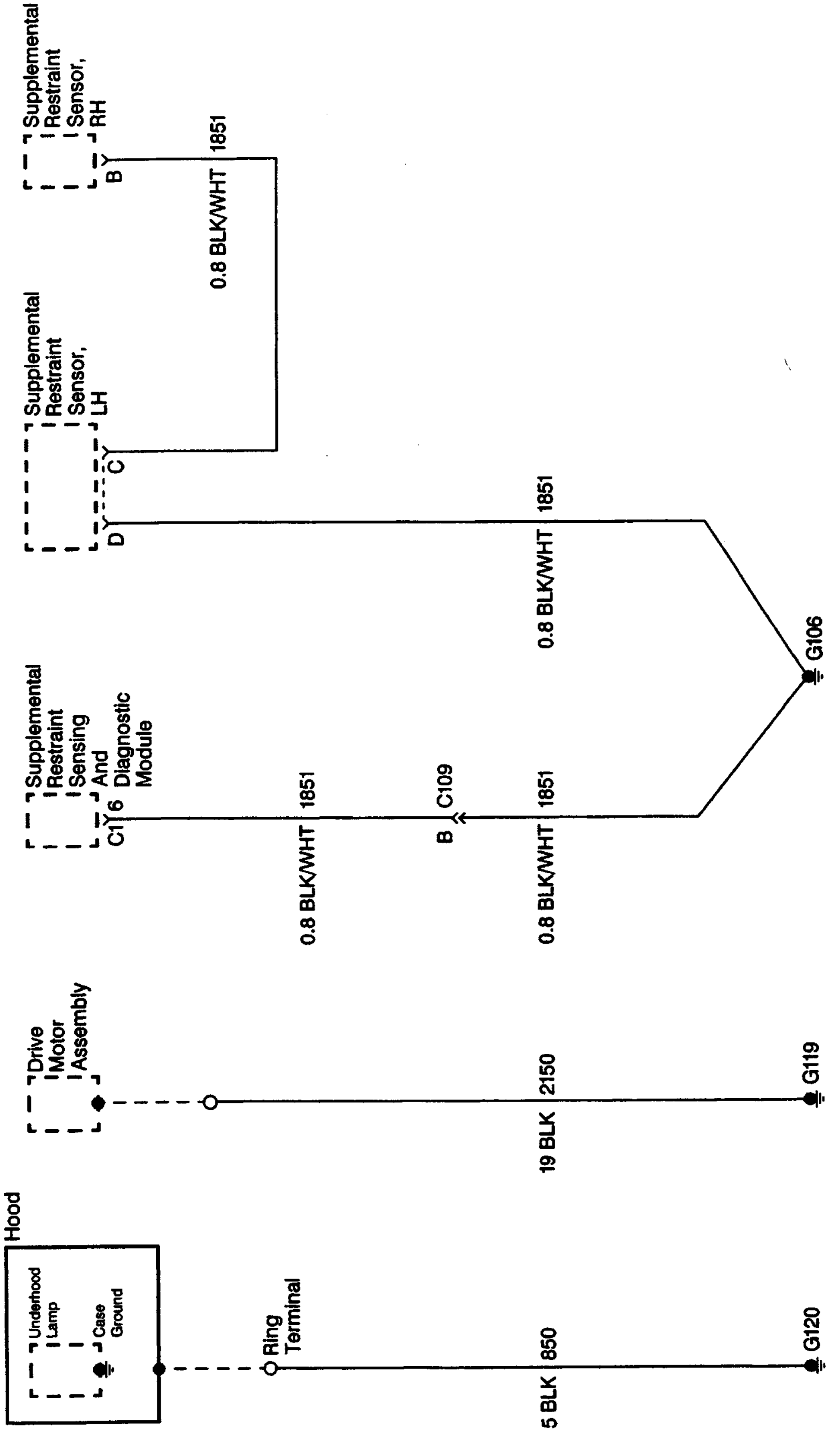
FUSE BLOCK DETAILS

Name	Location	201-Pg	Fig.	Conn.
Data Link Connector (DLC)	Lower LH side of instrument panel	65	66	59
Dome Lamp and High Mounted Stop Lamp	Rear center of cab	50	51	34
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
Headlamp Switch	Left of steering wheel, in IP	34	35	54
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C1	Under driver's seat	37	38	62
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C2	Under driver's seat	37	38	68
HVAC Control C1	Part of HVAC controls in center of IP	49	50	27
Inadvertent Power Relay	In the body bussed electrical center (BBEC)			
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
IP Module Switch	Center of dash, right of steering wheel			44
Jump Start Block	Under hood, inside right fender, at top center of wheel well	26	27	
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Radio C1	Center of IP behind Radio	56	57	56
Refrigerant Reversing Valve	Mounted to right frame rail in engine compartment, behind PEB	21	22	36
Secondary Battery Valve	Under PEB mounted to left frame rail			16
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)	Mounted to cab floor under middle of bench seat	47	48	58
Transmission Range Indicator Switch C2	Below drive motor, on left side, near axle	23	24	31
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Truck Body Control Module (TBC)—C3	Part of multifunction switch on steering column	55	56	60
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Windshield Wiper Motor	In engine compartment right of P/B booster, on bulkhead	10	11	42
Windshield Wiper Switch (Part Of Multifunction Switch)	Part of multifunction switch			
C103	Chassis harness to propulsion harness, near battery junction block			99
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108

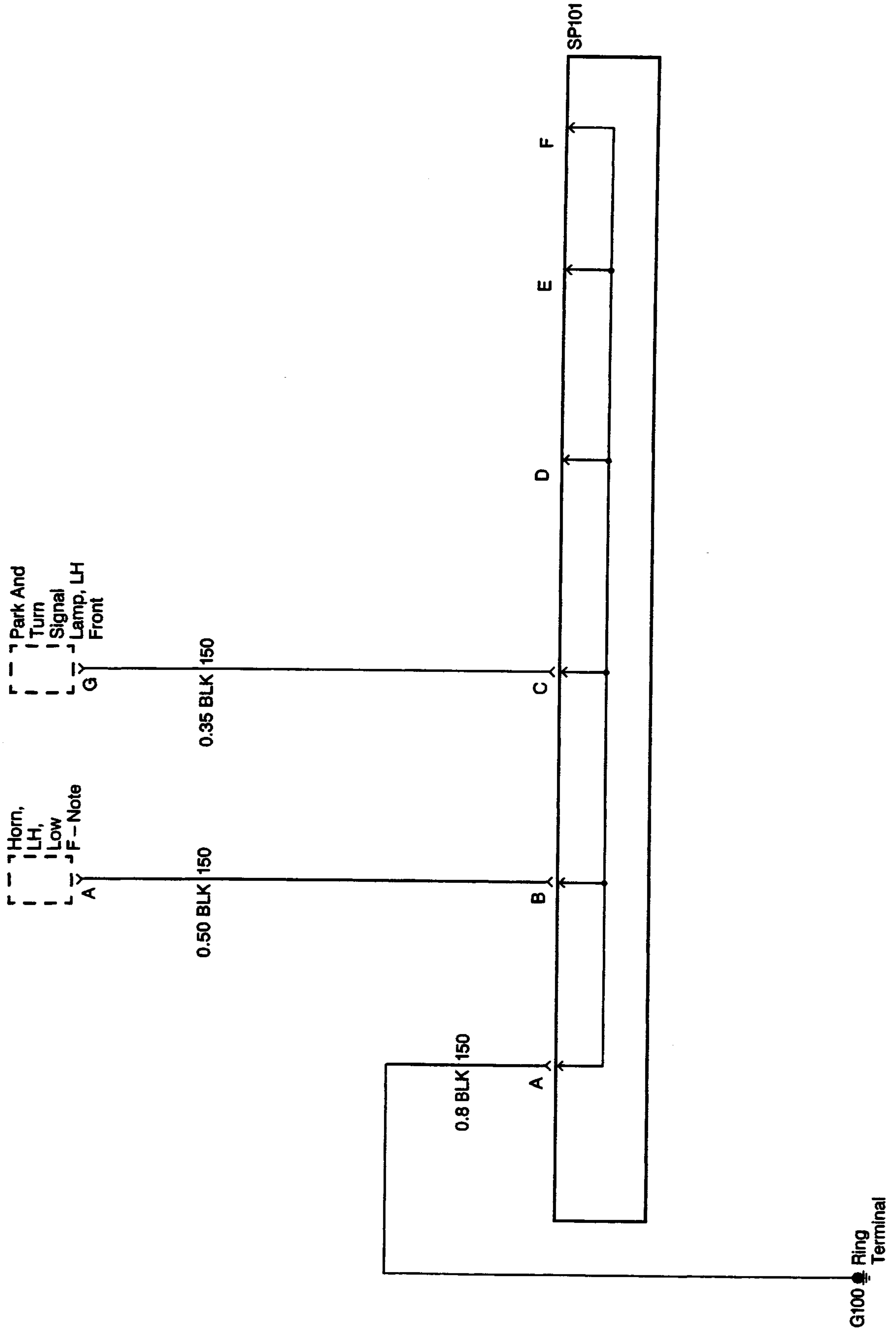
Name	Location	201-Pg	Fig.	Conn.
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C205	Dome lamp harness to Front body harness, behind LH side of IP beneath IP speaker	50	51	102
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C213	Propulsion harness to IP harness,			90
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
D100	Front body harness 6.5 cm right of blower motor break out			
D101	Front body harness 17.5 cm left of blower motor relay break out			
P100	Below brake master cylinder at bulkhead	25	26	
S106	Propulsion harness, approximately 25 cm left of power steering pump breakout			
S112	Propulsion harness, on D100			
S113	Propulsion harness, on D100			
S121				
S123	Propulsion harness, on D101			
S124	Propulsion harness, on D101			
S137	Drive unit harness, approximately 24 cm right of C113 breakout			
S138	Refrigerant valve jumper harness, approximately 15 cm right of refrigerant reversing valve breakout.			
S139	Refrigerant valve jumper harness, approximately 22.5 cm right of refrigerant reversing valve breakout.			
S217	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S218	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S225	In I/P harness run channel 13cm from TBC connector toward center I/P breakout	41	42	
S226	In I/P harness run channel 8 cm from center I/P breakout toward TBC	41	42	
S227	In I/P harness run channel 4 cm from courtesy lamp body harness inline connector breakout	41	42	
S236				
S238				
SP200	Behind IP cluster			

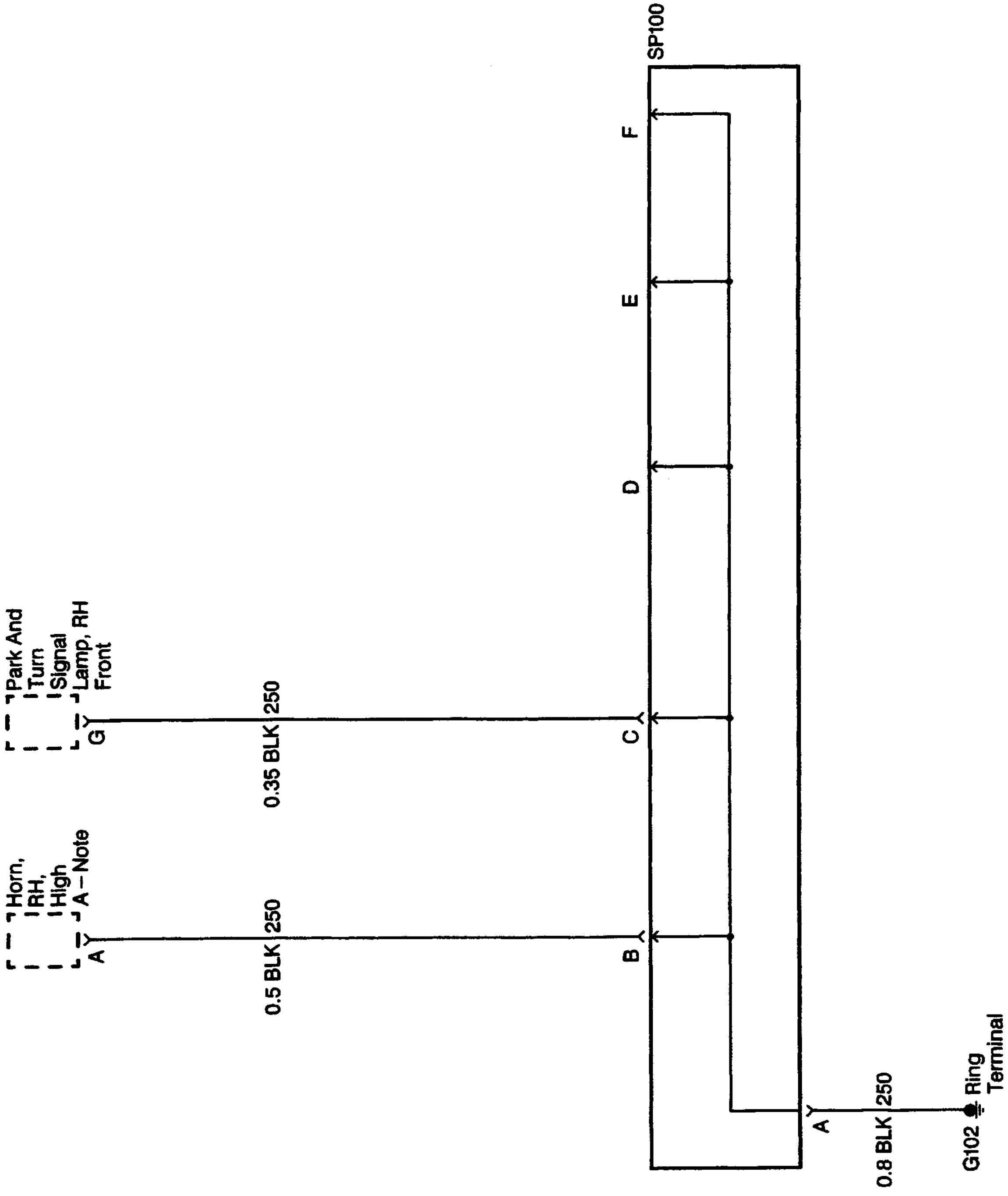
GROUND DISTRIBUTION


Drive Motor Assembly
19 BLK 2150
G119
Electronic Brake Control Module (EBCM)
C1
B
5 BLK 150
G110
Accessory Power Module (APM)
13 BLK 150
G111
Auxiliary Battery
13 BLK 50
G113
5 BLK 50
G112

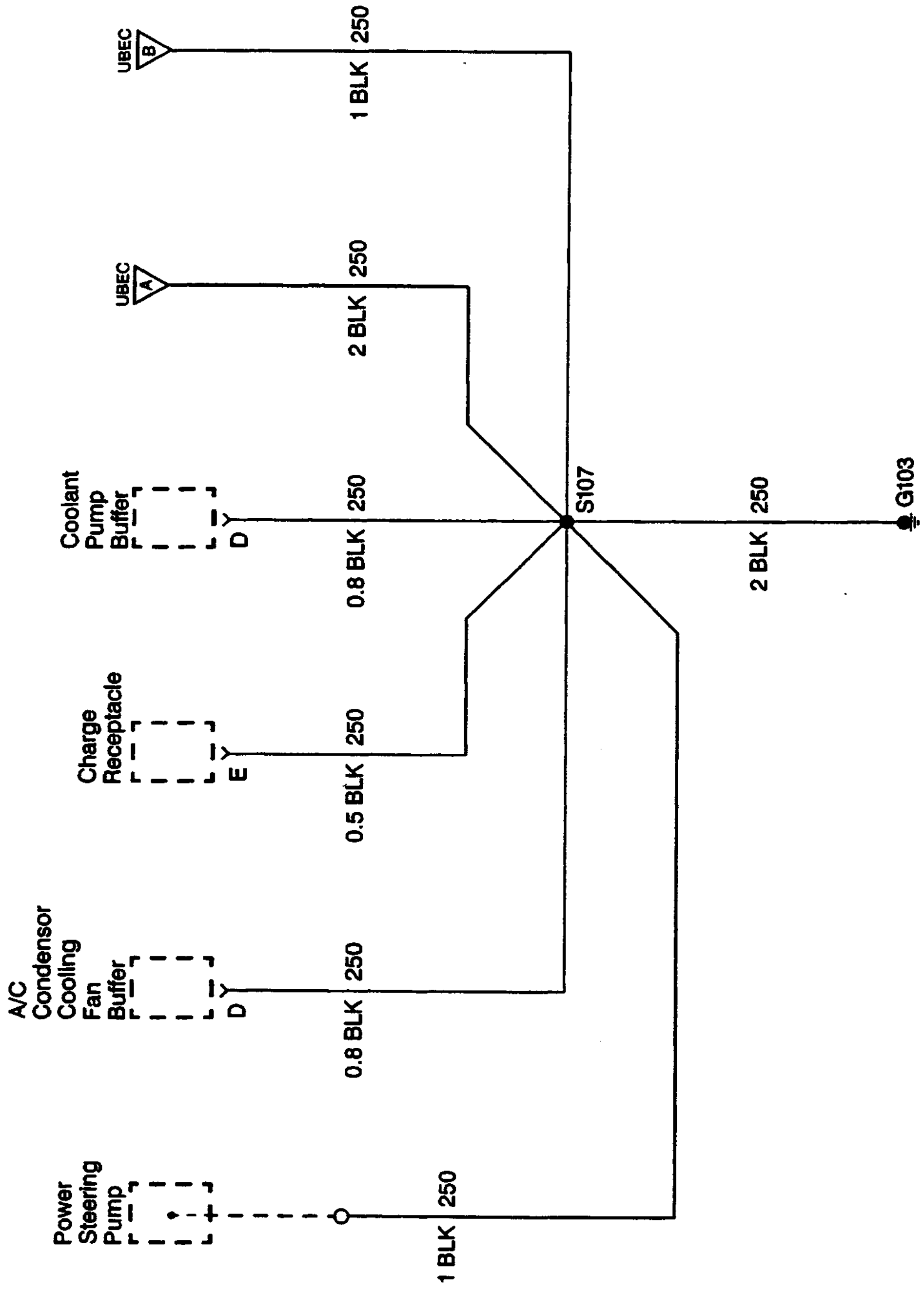

Supplemental Restraint Sensor, RH
B
0.8 BLK/WHT 1851
Supplemental Restraint Sensor, LH
C
D
0.8 BLK/WHT 1851
G106
Supplemental Restraint Sensing And Diagnostic Module
C1 6
0.8 BLK/WHT 1851
B C109
0.8 BLK/WHT 1851
Drive Motor Assembly
19 BLK 2150
G119
Hood
Underhood Lamp
Case Ground
Ring Terminal
5 BLK 850
G120

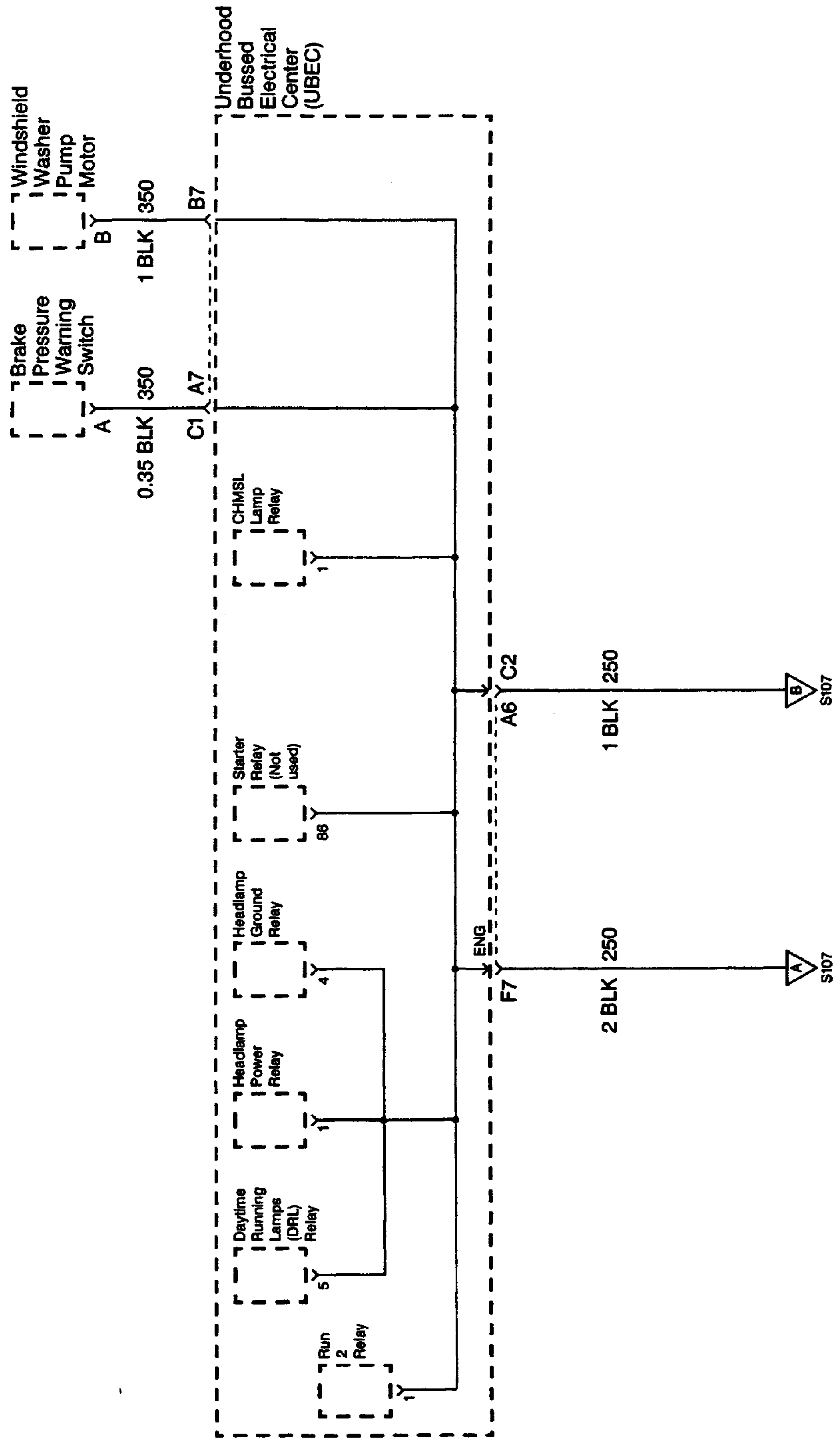
GROUND DISTRIBUTION


SP101
F
E
D
Park And Turn Signal Lamp, LH Front
G
0.35 BLK 150
C
Horn, LH, Low F-Note
A
0.50 BLK 150
B
0.8 BLK 150
A
G100
Ring Terminal

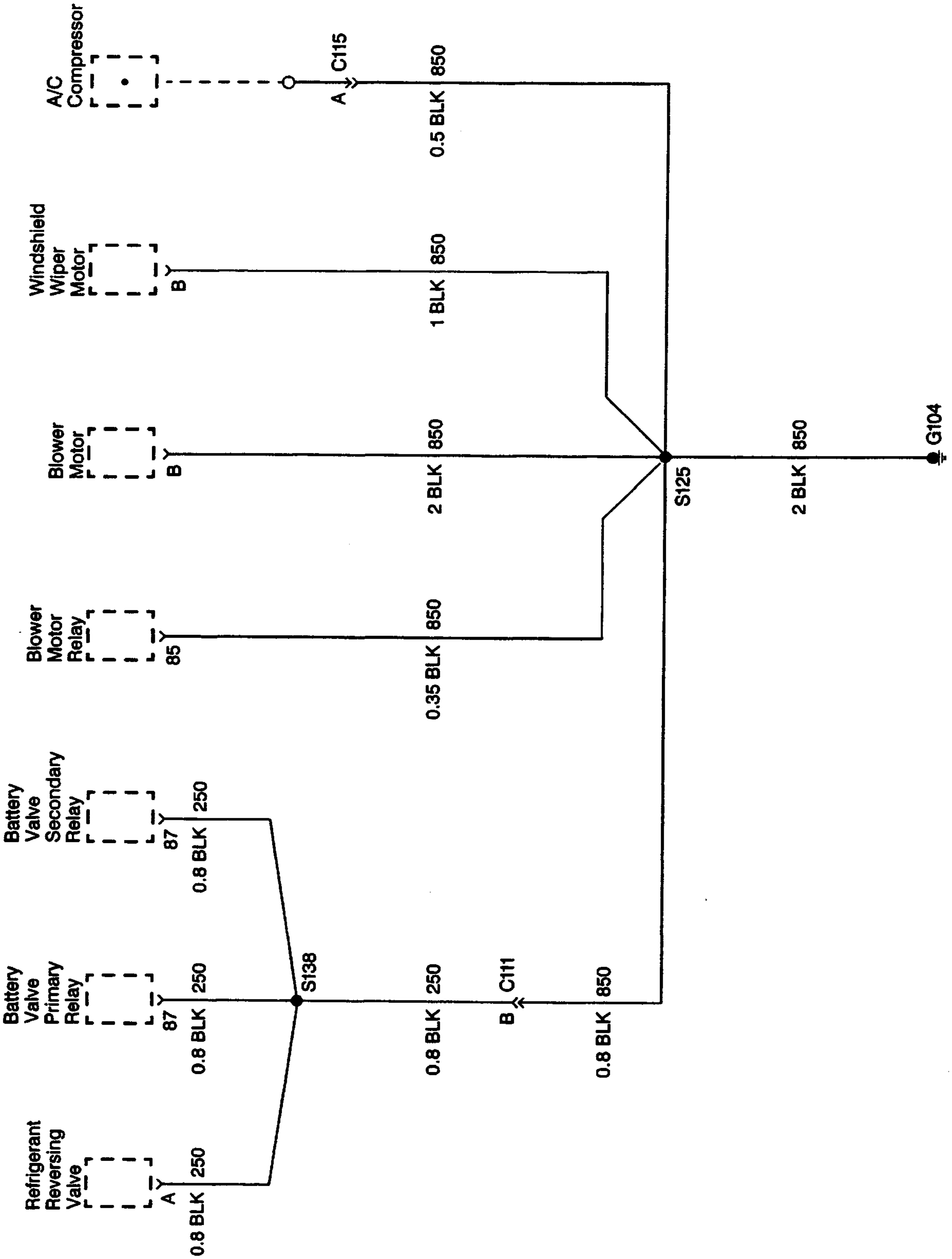

SP100
F
E
D
Park And Turn Signal Lamp, RH Front
G
250
0.35 BLK
C
Horn, RH, High A–Note
A
250
0.5 BLK
B
A
250
0.8 BLK
G102
Ring Terminal

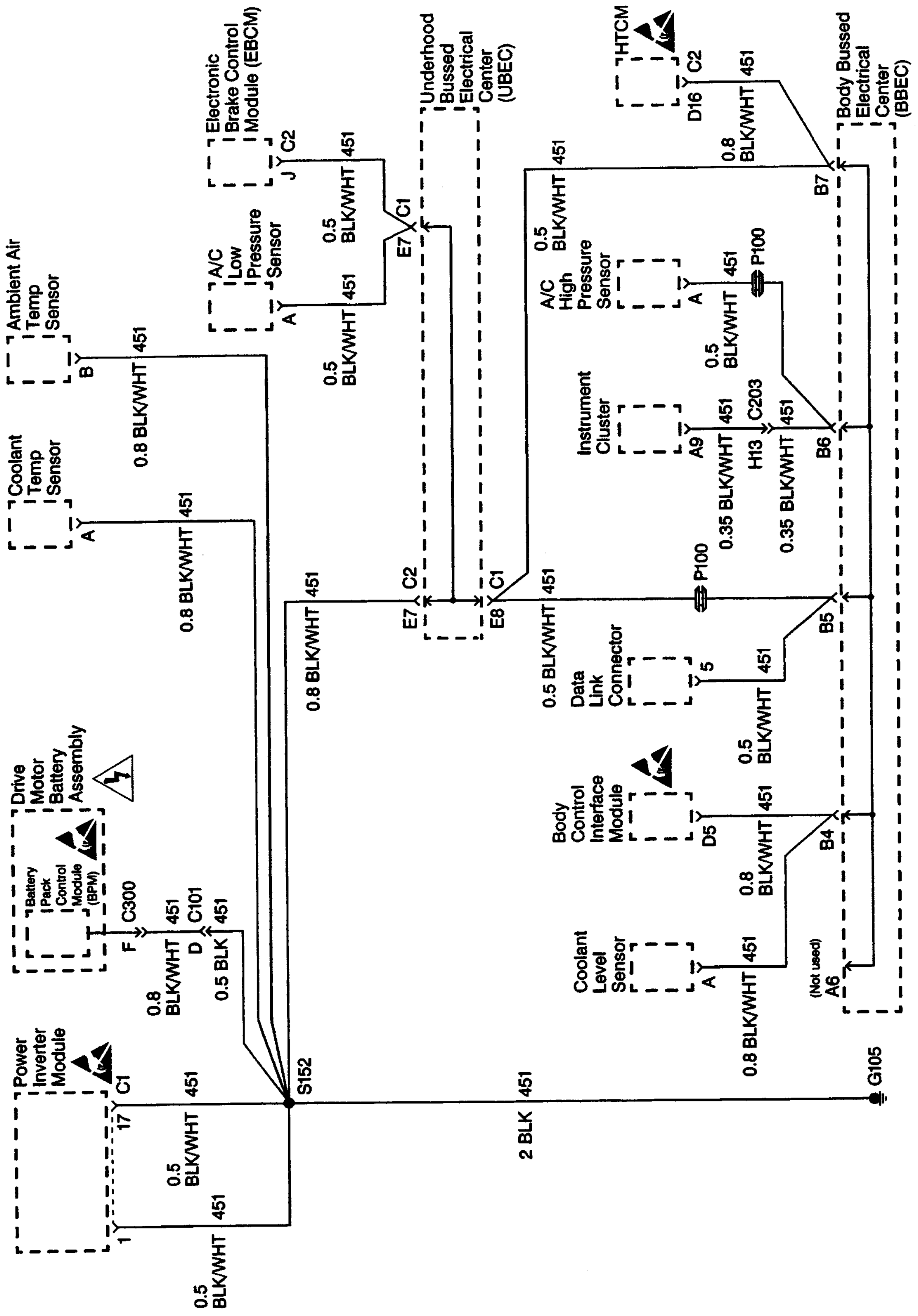
GROUND DISTRIBUTION


UBEC
B
1 BLK
250
UBEC
A
2 BLK
250
Coolant
Pump
Buffer
D
0.8 BLK
250
Charge
Receptacle
E
0.5 BLK
250
A/C
Condensor
Cooling
Fan
Buffer
D
0.8 BLK
250
Power
Steering
Pump
1 BLK
250
S107
2 BLK
250
G103

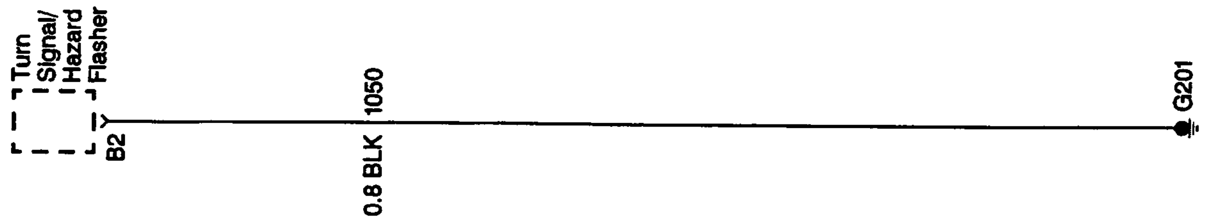

Windshield Washer Pump Motor
Brake Pressure Warning Switch
Underhood Bussed Electrical Center (UBEC)
B
1 BLK 350
B7
A
0.35 BLK 350
C1
A7
CHMSL Lamp Relay
1
C2
A6
1 BLK 250
B
S107
Starter Relay (Not used)
86
Headlamp Ground Relay
4
ENG
F7
2 BLK 250
A
S107
Headlamp Power Relay
1
Daytime Running Lamps (DRL) Relay
5
Run 2 Relay
1

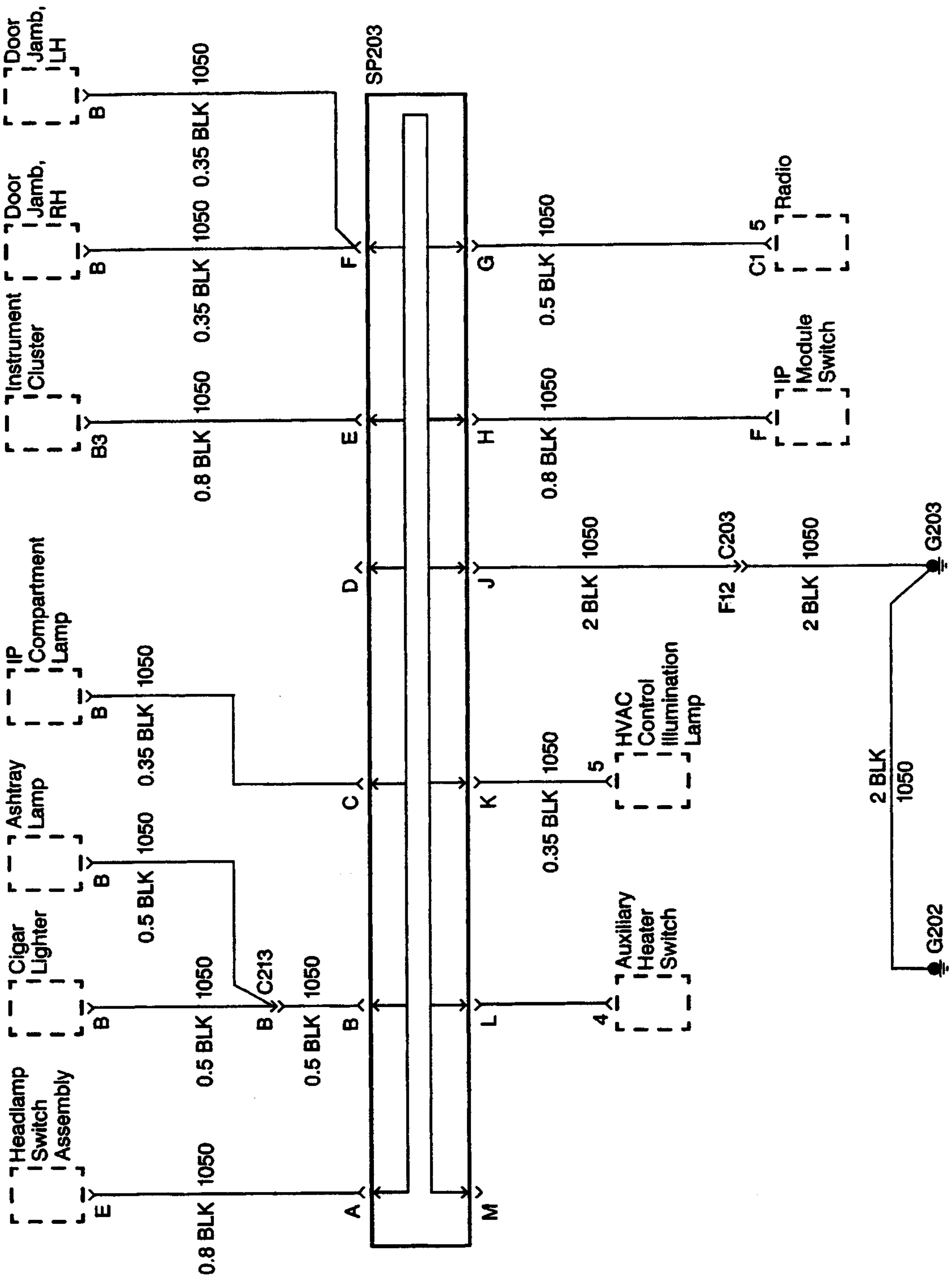
GROUND DISTRIBUTION


A/C Compressor
C115
A
850
0.5 BLK
Windshield Wiper Motor
B
850
1 BLK
Blower Motor
B
850
2 BLK
S125
850
2 BLK
G104
Blower Motor Relay
85
850
0.35 BLK
Battery Valve Secondary Relay
87
250
0.8 BLK
Battery Valve Primary Relay
87
250
0.8 BLK
S138
250
0.8 BLK
C111
B
850
0.8 BLK
Refrigerant Reversing Valve
A
250
0.8 BLK

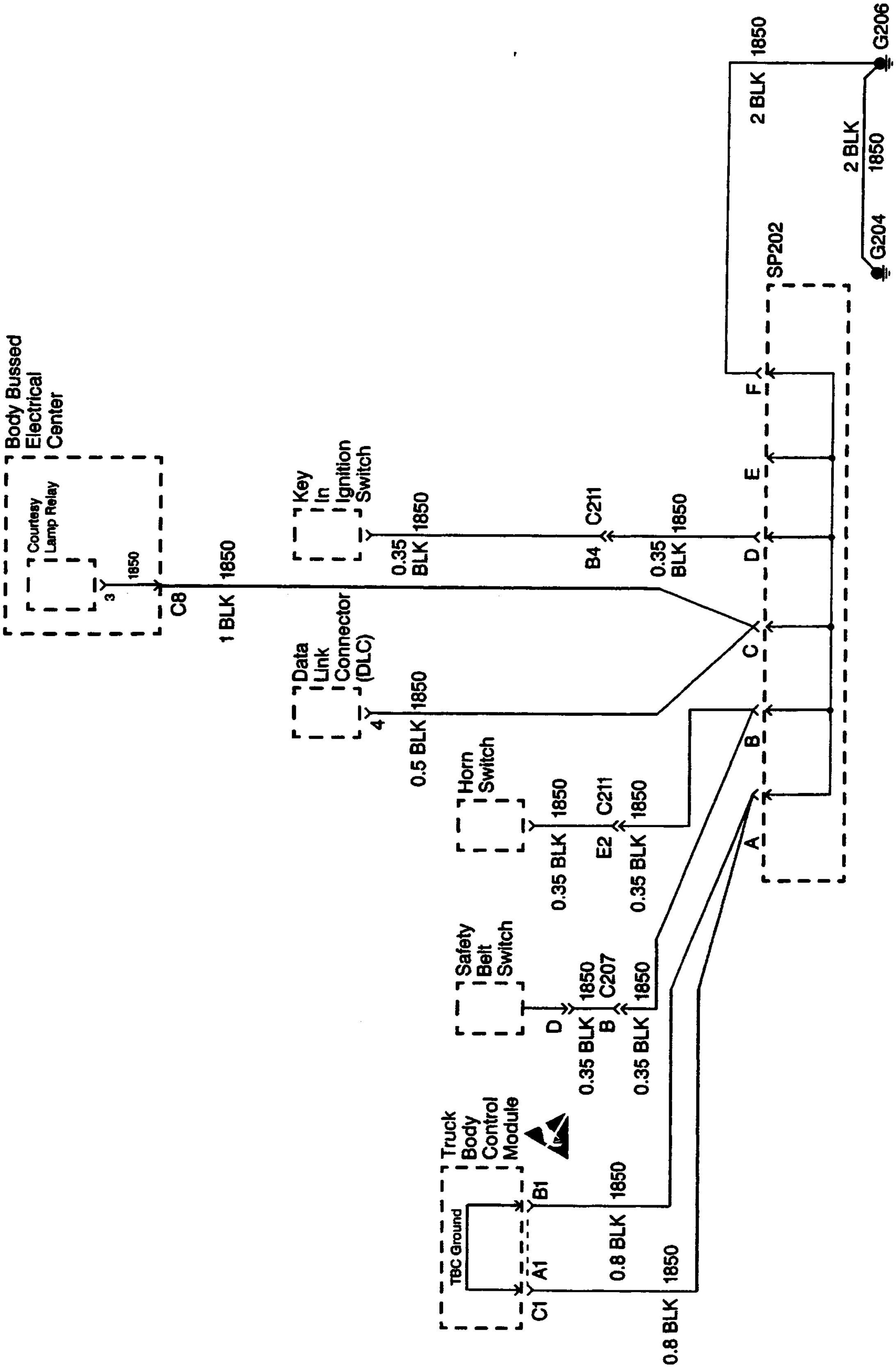

Power Inverter Module
C1
17
1
0.5 BLK/WHT 451
0.5 BLK/WHT 451
Drive Motor Battery Assembly
Battery Pack Control Module (BPM)
F
C300
0.8 BLK/WHT 451
D
C101
0.5 BLK 451
Coolant Temp Sensor
A
0.8 BLK/WHT 451
Ambient Air Temp Sensor
B
0.8 BLK/WHT 451
S152
2 BLK 451
G105
A/C Low Pressure Sensor
A
0.5 BLK/WHT 451
Electronic Brake Control Module (EBCM)
J
C2
0.5 BLK/WHT 451
0.5 BLK/WHT
E7
C1
Underhood Bussed Electrical Center (UBEC)
0.8 BLK/WHT 451
E7
C2
E8
C1
0.5 BLK/WHT 451
0.5 BLK/WHT 451
P100
A/C High Pressure Sensor
A
451
P100
0.5 BLK/WHT
Instrument Cluster
A9
0.35 BLK/WHT 451
C203
H13
0.35 BLK/WHT 451
HTCM
D16
C2
0.8 BLK/WHT 451
Data Link Connector
5
0.5 BLK/WHT 451
Body Control Interface Module
D5
0.8 BLK/WHT 451
Coolant Level Sensor
A
0.8 BLK/WHT 451
Body Bussed Electrical Center (BBEC)
B7
B6
B5
B4
(Not used)
A6

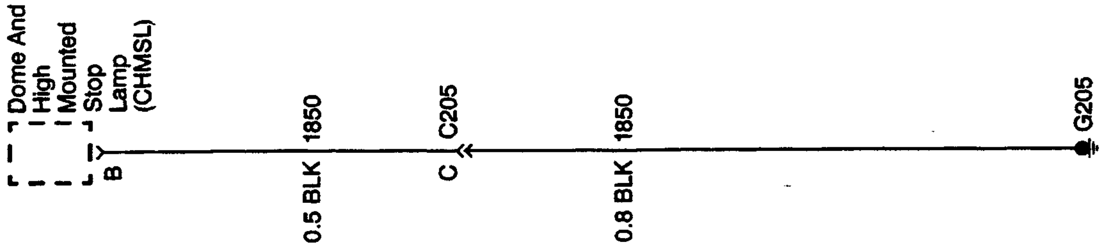
GROUND DISTRIBUTION


Turn Signal/ Hazard Flasher
B2
1050
0.8 BLK
G201

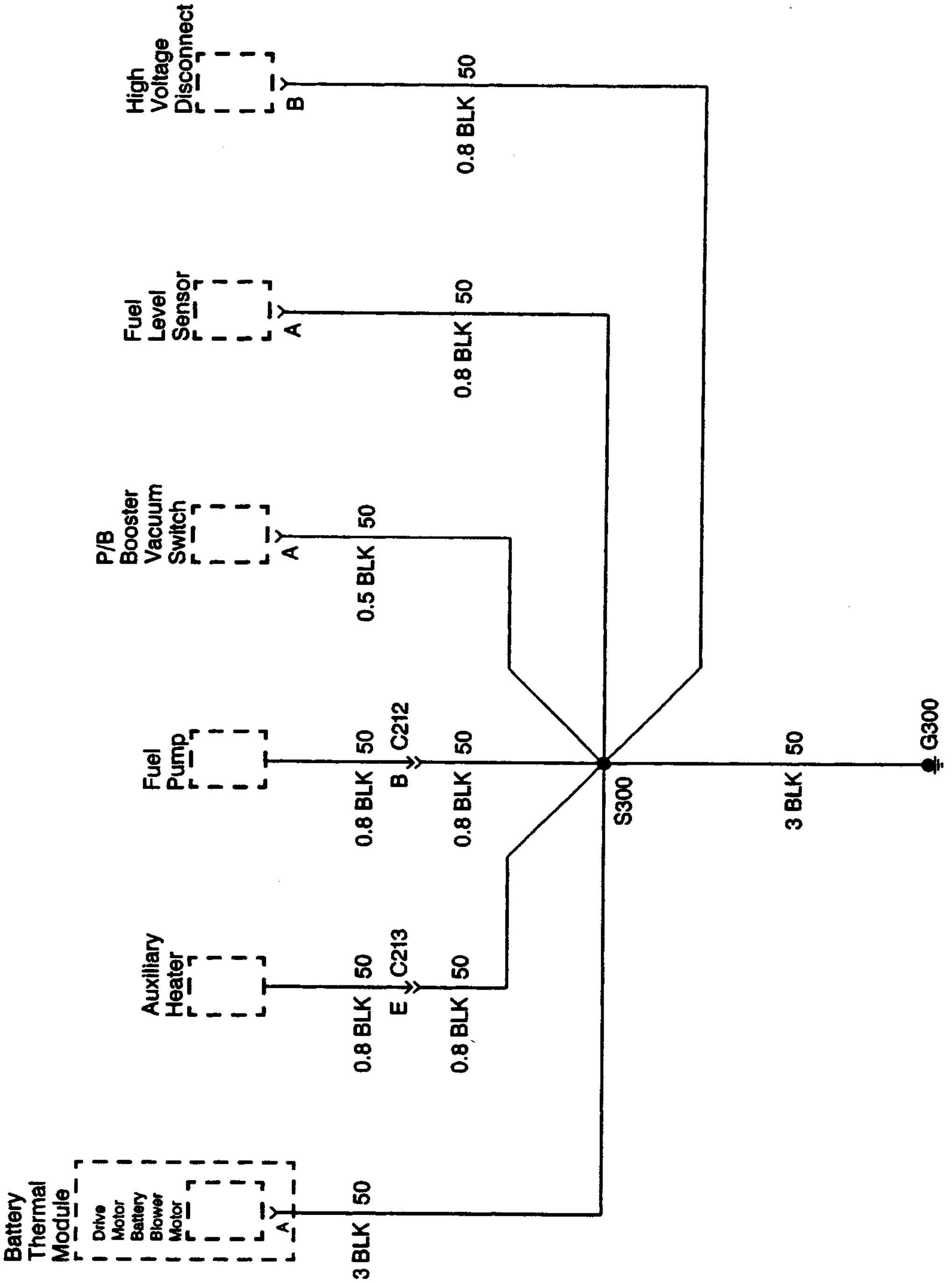

Door Jamb, LH
B
0.35 BLK 1050
Door Jamb, RH
B
0.35 BLK 1050
Instrument Cluster
B3
0.35 BLK 1050
0.8 BLK 1050
SP203
F
E
D
C
B
A
G
H
J
K
L
M
0.5 BLK 1050
Radio
C1 5
IP Module Switch
F
0.8 BLK 1050
2 BLK 1050
C203
F12
2 BLK 1050
G203
IP Compartment Lamp
B
0.35 BLK 1050
HVAC Control Illumination Lamp
5
0.35 BLK 1050
Ashtray Lamp
B
0.5 BLK 1050
2 BLK 1050
Cigar Lighter
B
0.5 BLK 1050
C213
B
0.5 BLK 1050
Auxiliary Heater Switch
4
G202
Headlamp Switch Assembly
E
0.8 BLK 1050

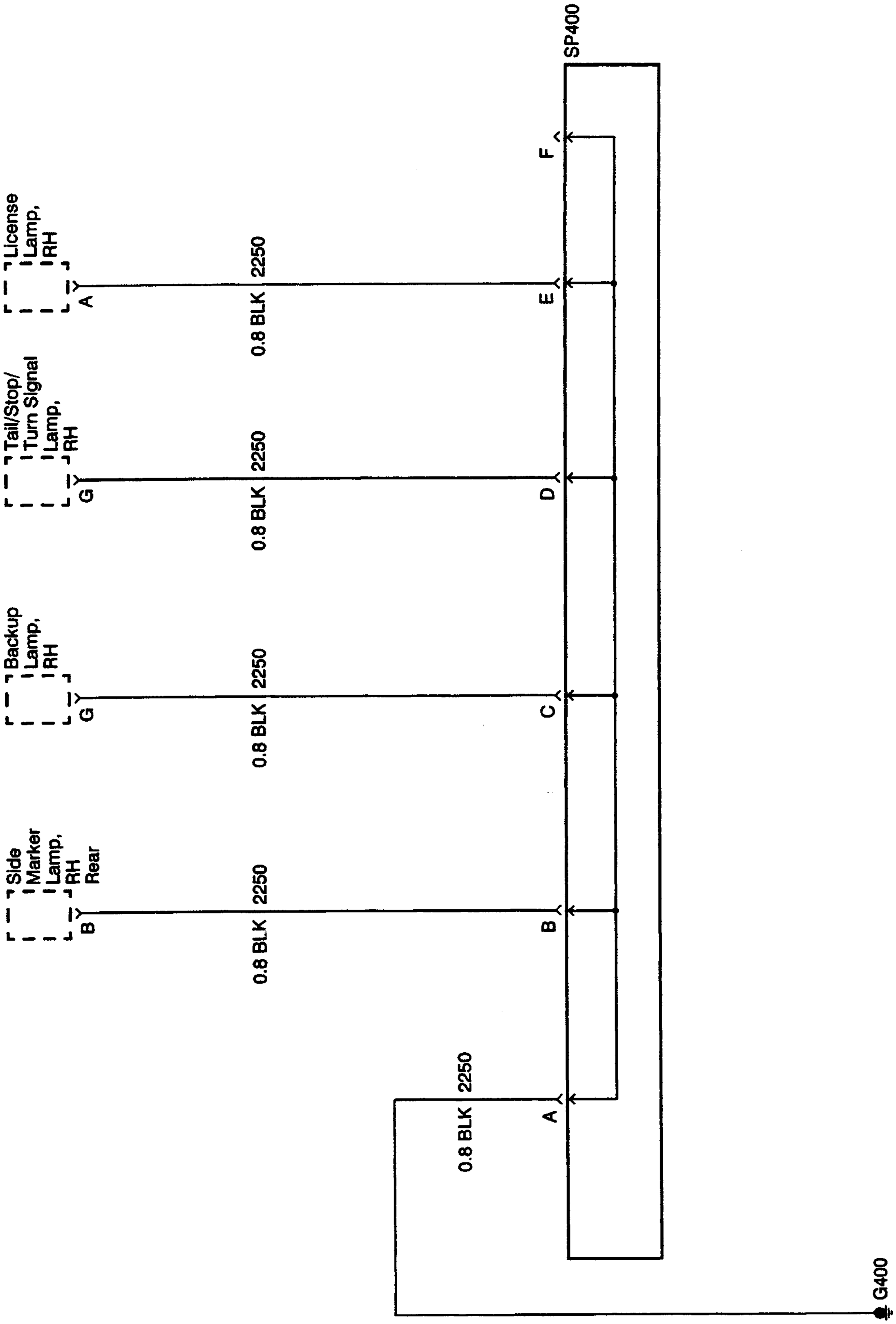
GROUND DISTRIBUTION


Body Bussed Electrical Center
Courtesy Lamp Relay
3
1850
C8
1 BLK 1850
Key In Ignition Switch
0.35 BLK 1850
B4
C211
0.35 BLK 1850
Data Link Connector (DLC)
4
0.5 BLK 1850
Horn Switch
0.35 BLK 1850
E2
C211
0.35 BLK 1850
Safety Belt Switch
D
0.35 BLK 1850
B
C207
0.35 BLK 1850
Truck Body Control Module
TBC Ground
B1
0.8 BLK 1850
A1
C1
0.8 BLK 1850
A
B
C
D
E
F
SP202
2 BLK 1850
G206
2 BLK 1850
G204

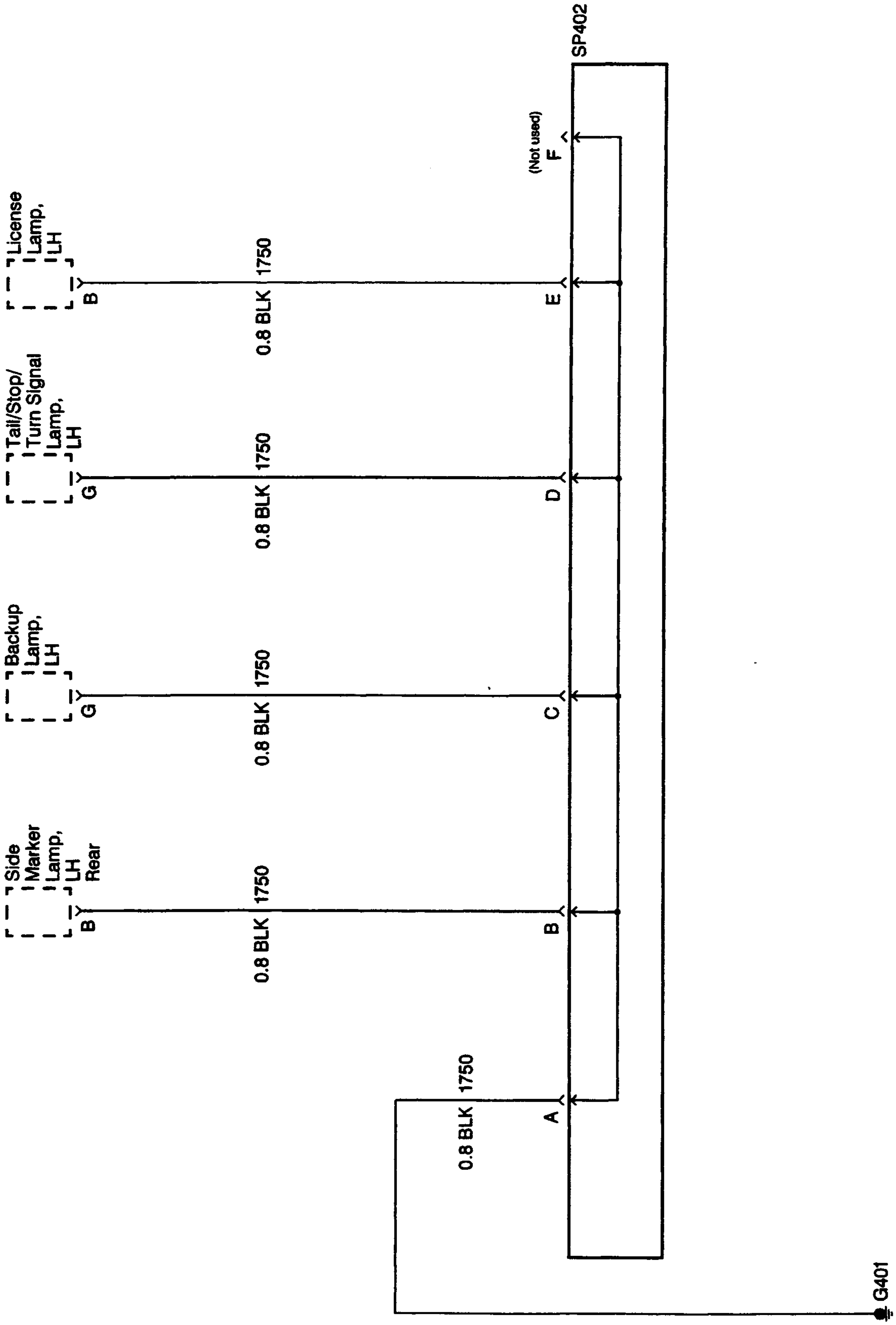

Dome And High Mounted Stop Lamp (CHMSL)
B
0.5 BLK
1850
C
C205
0.8 BLK
1850
G205

GROUND DISTRIBUTION

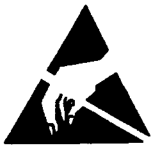
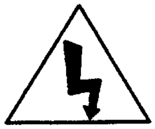

High Voltage Disconnect
B
0.8 BLK 50
Fuel Level Sensor
A
0.8 BLK 50
P/B Booster Vacuum Switch
A
0.5 BLK 50
Fuel Pump
0.8 BLK 50
B C212
0.8 BLK 50
S300
3 BLK 50
G300
Auxiliary Heater
0.8 BLK 50
E C213
0.8 BLK 50
Battery Thermal Module
Drive Motor Battery Blower Motor
A
3 BLK 50


License Lamp, RH
A
0.8 BLK 2250
E
Tail/Stop/ Turn Signal Lamp, RH
G
0.8 BLK 2250
D
Backup Lamp, RH
G
0.8 BLK 2250
C
Side Marker Lamp, RH Rear
B
0.8 BLK 2250
B
SP400
F
0.8 BLK 2250
A
G400

GROUND DISTRIBUTION


SP402
(Not used)
F
License Lamp, LH
B
0.8 BLK 1750
E
Tail/Stop/ Turn Signal Lamp, LH
G
0.8 BLK 1750
D
Backup Lamp, LH
G
0.8 BLK 1750
C
Side Marker Lamp, LH Rear
B
0.8 BLK 1750
B
0.8 BLK 1750
A
G401

Ground Distribution Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A–3–0.
	This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.

Ground Distribution Component Location Table

Name	Location	201-Pg	Fig.	Conn.
A/C Compressor Motor	Right rear of engine compartment behind (PEB)	2	3	
A/C Condenser Cooling Fan Buffer	Mounted to front of power electronics bay (PEB) bracket	9	10	31
A/C High Pressure Sensor	At top of bulkhead behind PEB, on A/C High pressure pipe	21	22	23
A/C Low Pressure Sensor	Near bulkhead, behind PEB, on A/C low pressure pipe	21	22	23
Accessory Power Control Module (APM)	Mounted to the lower right bottom of the power electronics bay (PEB)	2	3	61
Accessory Power Control Module (APM) Negative Cable	At left rear of APM near bottom	2	3	
Ambient Air Temperature Sensor	Mounted to LH rear of grill near center of grill	4	5	0
Ashtray Lamp	Above ashtray	44	45	1
Auxiliary Battery	At right front corner of engine compartment	1	2	
Auxiliary Battery Negative Cable	Between auxiliary battery and RH frame rail	1	2	
Auxiliary Heater (FFH)	Mounted under truck, in front of battery pack assembly, between frame rails	28	29	37
Auxiliary Heater (FFH) Switch	Left of steering column in IP			31
Backup Lamp, LH	Left rear corner of vehicle	52	53	24
Backup Lamp, RH	Right rear corner of vehicle	52	53	24
Battery Pack Blower Assembly	Mounted to the front of the battery pack, below the cab	30	31	25
Battery Pack Control Module	Inside drive motor battery pack assembly			
Battery Thermal Module (see Battery Pack Blower Assembly)	Mounted to the front of the battery pack, below the cab	0	1	25
Battery Valve Primary Relay	Mounted to bracket at passenger side rear of engine compartment			32
Battery Valve Secondary Relay	Mounted to the front of the battery pack, below the cab			32

GROUND DISTRIBUTION

Name	Location	201-Pg	Fig.	Conn.
Blower Motor	RH side of engine compartment	25	26	2
Blower Motor Relay	RH rear of engine compartment	24	25	38
Body Bussed Electrical Center	Behind center of IP			78
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67
Brake Pressure Warning Switch	Part of brake proportioning valve assembly	14	16	3
Brake Transmission Shift Interlock (BTSI) Actuator	On steering column above knee bolster	39	40	3
Charge Receptacle	Behind front license plate	0	1	50
Cigar Lighter	Lower center of IP			
Coolant Level Sensor	In bottom of coolant reservoir	25	26	26
Coolant Pump Buffer	On coolant pump bracket above front crossmember	5	6	33
Coolant Temp Sensor	In coolant junction block near coolant pump	5	6	4
Courtesy Lamp Relay	In the body bussed electrical center (BBEC)			
Data Link Connector (DLC)	Lower LH side of instrument panel	65	66	59
Daytime Running Lamps (DRL) Relay	In underhood bussed electrical center (UBEC)	45	46	39
Dome Lamp and High Mounted Stop Lamp	Rear center of cab	50	51	34
Door Jamb Switch, LH	In LH side of IP			26
Door Jamb Switch, RH	In RH side of IP	38	39	27
Drive Motor Assembly	In engine compartment below PEB	0	1	
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Drive Motor Battery Blower Motor	Inside battery thermal module			
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
Fuel Level Sensor	Mounted in the top of the fuel tank	29	30	7
Fuel Pump	Above fuel tank behind crossmember			8
Headlamp Switch	Left of steering wheel, in IP	34	35	54
Headlamp Ground Relay	In underhood bussed electrical center (UBEC)			
Headlamp Power Relay	In underhood bussed electrical center (UBEC)			
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C2	Under driver's seat	37	38	68
High Voltage Disconnect	On harness right of brake booster	12	13	35
High-Mounted Stop Light Relay	In underhood bused electrical center			
Horn Switch	Behind pad in steering wheel	48	49	
Horn, LH	in LH fender behind washer bottle	4	5	11
Horn, RH	In RH fender near auxiliary battery	4	5	12
HVAC Control Illumination Lamp	Behind HVAC controls	49	50	55
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Compartment Lamp	Inside IP compartment	43	44	12
IP Module Switch	Center of dash, right of steering wheel			44
Key In Ignition Switch	In steering column, part of ignition switch			
License Lamp, LH	Left center of rear bumper	59	60	14

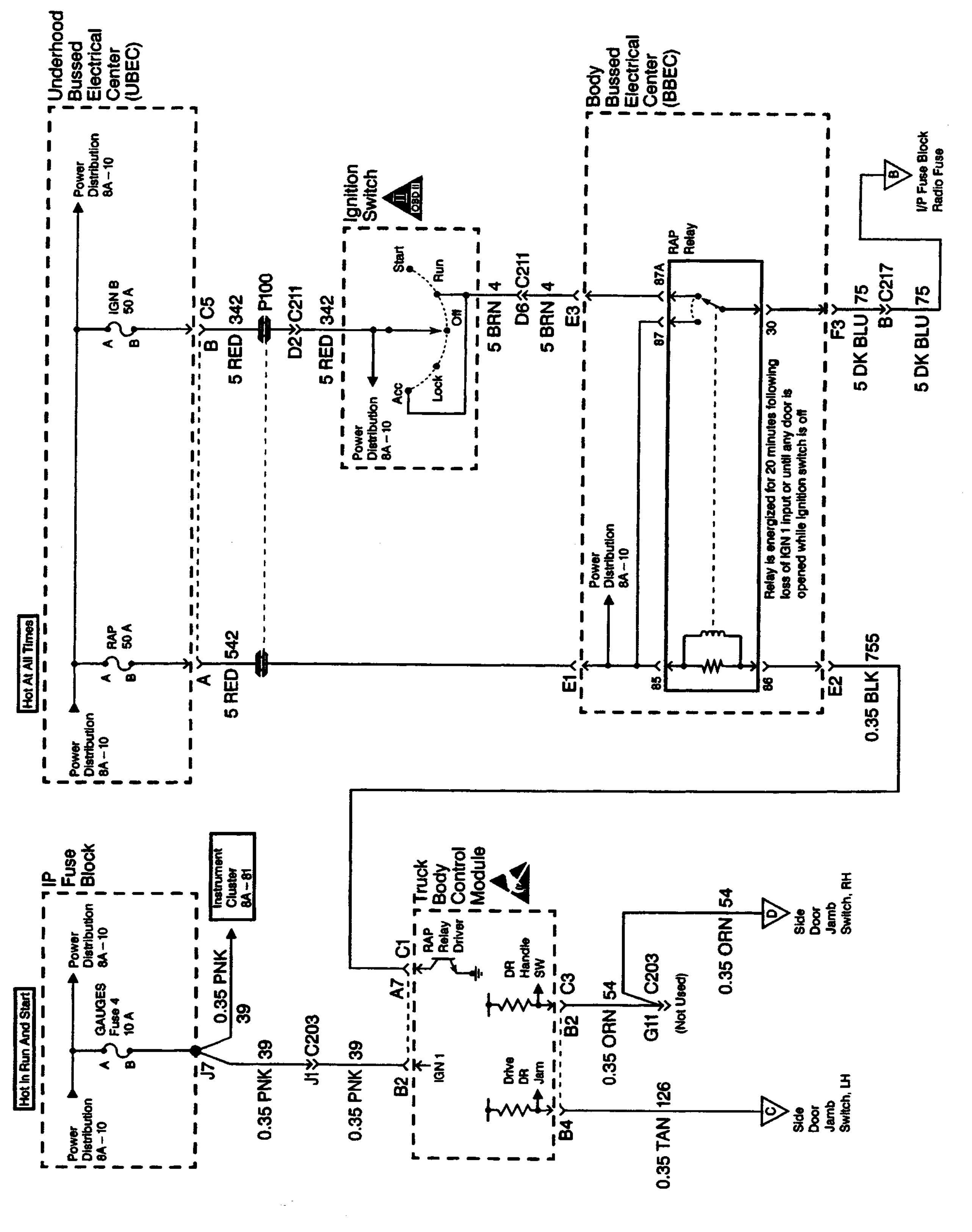
Name	Location	201-Pg	Fig.	Conn.
License Lamp, RH	Right center of rear bumper	59	60	14
P/B Booster Vacuum Switch	On left end of vacuum reserve canister	0	1	15
Park/Turn Signal Lamp, LH Front	Left front corner of front bumper	4	5	28
Park/Turn Signal Lamp, RH Front	Right front corner of front bumper	4	5	29
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Power Steering Pump Motor	On right frame rail near PEB	0	1	
Radio C1	Center of IP behind Radio	56	57	56
Refrigerant Reversing Valve	Mounted to right frame rail in engine compartment, behind PEB	21	22	36
Run 2 Relay	In relay center	45	46	41
Safety Belt Switch	Front body harness to seat belt switch, near base of LH seatbelt receiver	36	37	46
Side Marker Lamp, LH Rear	Left rear corner of vehicle	52	53	17
Side Marker Lamp, RH Rear	Right rear corner of vehicle	52	53	18
Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)	Mounted to cab floor under middle of bench seat	47	48	58
Supplemental Inflatable Restraint Discriminating Sensor, LH Front	On left bottom of core support	6	7	37
Supplemental Inflatable Restraint Discriminating Sensor, RH Front	On right bottom of core support	6	7	19
Tail/Stop/Turn Signal Lamp, LH Rear	Left rear corner of vehicle	52	53	29
Tail/Stop/Turn Signal Lamp, RH Rear	Right rear corner of vehicle	52	53	30
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Turn Signal/Hazard Flasher	Taped to harness below C204	63	64	48
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Lamp	Under hood, left side, near bottom of hood	10	11	
Windshield Washer Pump	In lower right side of windshield washer bottle	7	8	22
Windshield Wiper Motor	In engine compartment right of P/B booster, on bulkhead	10	11	42
C101	Propulsion harness to body harness,	58	57	96
C103	Chassis harness to propulsion harness, near battery junction block			99
C109	Front body harness to inflatable restraint harness, near battery junction block	13	14	84
C111		21	22	93
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C205	Dome lamp harness to Front body harness, behind LH side of IP beneath IP speaker	50	51	102

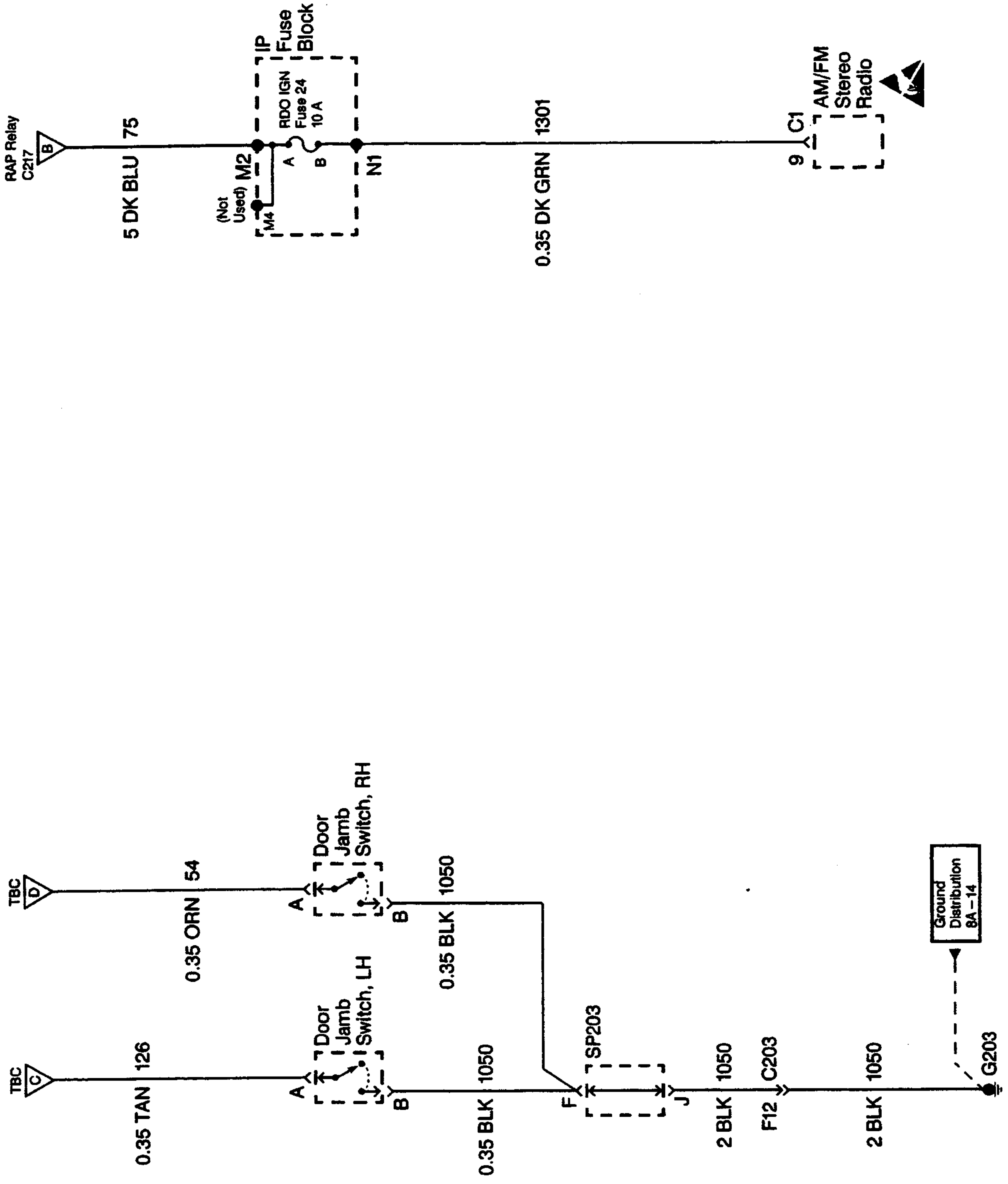
GROUND DISTRIBUTION

Name	Location	201-Pg	Fig.	Conn.
C207	Front body harness to seat belt switch extension, under driver's seat			97
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C213	Propulsion harness to IP harness,			90
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
G100	Left front of vehicle mounted to radiator core support by LH headlamp	4	5	
G102	On right front of vehicle, mounted to radiator core support, by RH headlamp	4	5	
G103	On top of RH frame rail, near auxiliary battery	5	6	
G104	On top of RH frame rail, near auxiliary battery	5	6	
G105	On top of LH frame rail, near windshield washer bottle			
G106	On top of LH frame rail, near windshield washer bottle	6	7	
G110	Drive Motor Unit to Frame under center of engine compartment	0	0	
G111	On LH frame rail near APM	2	3	
G112	Behind RH side of core support near auxiliary battery	62	63	
G113	On RH frame rail, near auxiliary battery	1	2	
G119	Between motor and right frame rail			
G120	Between hood and bulkhead			
G201	On power steering pump bracket	57	58	
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
G204	On power steering pump bracket	63	64	
G205	Left middle of vehicle on top of frame above front leaf spring mount	63	64	
G206	Left rear of vehicle on frame			
G300	Left middle of vehicle on top of frame above front leaf spring mount			
G400	Right rear of vehicle on frame			
G401	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S107	Propulsion harness, approximately 5 cm left of inverter module breakout			
S125	Front body harness 20cm right of brake vacuum booster at top of bulkhead			
S138	Refrigerant valve jumper harness, approximately 15 cm right of refrigerant reversing valve breakout.			
S139	Refrigerant valve jumper harness, approximately 22.5 cm right of refrigerant reversing valve breakout.			

Name	Location	201-Pg	Fig.	Conn.
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
S300				
SP100	Left front of vehicle mounted to radiator support			
SP101	Right front of vehicle mounted to radiator support	62	63	
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			
SP400	Mounted to left rear frame rail	52	53	
SP402	Mounted to right rear frame rail	66	67	

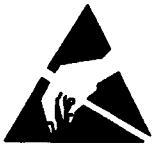
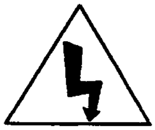
RETAINED ACCESSORY POWER


Underhood Bussed Electrical Center (UBEC)
Power Distribution 8A-10
IGN B 50 A
A
B
C5
B
5 RED 342
P100
D2
C211
5 RED 342
Ignition Switch
Start
Run
Off
Lock
Acc
Power Distribution 8A-10
5 BRN 4
D6
C211
5 BRN 4
E3
Body Bussed Electrical Center (BBEC)
RAP Relay
87A
87
30
85
86
Relay is energized for 20 minutes following loss of IGN 1 input or until any door is opened while ignition switch is off
Power Distribution 8A-10
F3
75
5 DK BLU
B
C217
75
5 DK BLU
B
I/P Fuse Block Radio Fuse
Hot At All Times
Power Distribution 8A-10
RAP 50 A
A
B
A
5 RED 542
E1
E2
0.35 BLK 755
IP Fuse Block
Hot In Run And Start
Power Distribution 8A-10
Power Distribution 8A-10
GAUGES Fuse 4 10 A
A
B
Instrument Cluster 8A-81
0.35 PNK 39
J7
0.35 PNK 39
J1
C203
0.35 PNK 39
Truck Body Control Module
C1
A7
RAP Relay Driver
B2
IGN 1
DR Handle SW
C3
B2
Drive DR Jam
B4
0.35 ORN 54
G11
C203
(Not Used)
0.35 ORN 54
D
Side Door Jamb Switch, RH
0.35 TAN 126
C
Side Door Jamb Switch, LH


RAP Relay
C217
B
5 DK BLU
75
(Not Used)
M4
M2
A
B
RDO IGN
Fuse 24
10 A
IP Fuse Block
N1
0.35 DK GRN
1301
9
C1
AM/FM Stereo Radio
TBC
D
0.35 ORN
54
A
Door Jamb Switch, RH
B
0.35 BLK
1050
TBC
C
0.35 TAN
126
A
Door Jamb Switch, LH
B
0.35 BLK
1050
F
SP203
J
2 BLK
1050
F12
C203
2 BLK
1050
G203
Ground Distribution 8A-14

RETAINED ACCESSORY POWER

Retained Accessory Power Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.*

Retained Accessory Power Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Body Bussed Electrical Center	Behind center of IP			78
Door Jamb Switch, LH	In LH side of IP			26
Door Jamb Switch, RH	In RH side of IP	38	39	27
Ignition Switch	On steering column, under column trim panel	39	40	
IP Fuse Block	LH side of instrument panel	33	34	76
Radio C1	Center of IP behind Radio	56	57	56
Retained Accessory Power Relay	In the body bussed electrical center (BBEC)			
Truck Body Control Module (TBC) - C1	In power distribution center	55	56	65
Truck Body Control Module (TBC) - C3	Part of multifunction switch on steering column	55	56	60
Underhood Bussed Electrical Center (UBEC)- C5	At UBEC	53	54	20
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
G203	Left rear of vehicle on frame	63	64	
P100	Below brake master cylinder at bulkhead	25	26	
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			

DIAGNOSIS - RETAINED ACCESSORY POWER

Troubleshooting Hints:

- Check for the following conditions:
- A poor connection at the Truck Body Control Module, inspect harness connections for the following conditions:
  - — Backed out terminals
  - — Improper mating
  - — Broken locks
  - — Improperly formed or damaged terminals
  - — Poor terminal to wire connections
  - — A mis-routed or damaged harness
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for changes.

NO POWER TO RAP ACCESSORIES

Step	Action	Value(s)	Yes	No
1	1. Remove RAP relay. 2. Place a fused jumper between RAP relay socket terminals 30 and 87A. 3. Turn Ignition switch to run. Do you have power to the RAP accessories?	—	Go to Step 2	Go to Step 4
2	1. Replace RAP relay. Is action complete?	—	Go to Step 3	—
3	1. Verify normal operation of RAP relay. Is action complete?	—	System OK	—
4	Replace Body Bussed Electrical Center.	—	Go to Step 3	—

NO RAP RELAY DELAY

Step	Action	Value(s)	Yes	No
1	1. Turn Ignition switch on. 2. Turn on the windshield wipers. Do the windshield wipers operate?	—	Go to Step 2	Go to Step 6
2	1. Remove RAP relay. 2. Connect a test lamp between RAP relay socket terminal 85 and ground. Did the test lamp light?	—	Go to Step 3	Go to Step 10
3	1. Disconnect the brown Truck Body Control Module connector. 2. Connect a jumper wire between terminal A7 and battery ground. 3. Connect a test lamp between the RAP relay socket terminals 85 and 86. Did the test lamp light?	—	Go to Step 4	Go to Step 12
4	1. Replace RAP relay. Is repair complete?	—	Go to Step 5	—
5	1. Verify normal operation of RAP relay. Is action complete?	—	System OK	—

RETAINED ACCESSORY POWER

Step	Action	Value(s)	Yes	No
6	1. Check RAP Maxi Fuse. Is RAP fuse open?	—	Go to Step 7	Go to Step 11
7	1. Remove Power Seats fuse. 2. Connect a test light between RAP MAXI fuse terminal A and B. Does lamp light? Leave test lamp connected for Steps 7 and 8. (if applicable)	—	Go to Step 8	Go to Cell 140
8	1. Disconnect negative Battery terminal. 2. Disconnect Body Bussed Electrical Center connector. 3. Reconnect negative battery terminal. Is test lamp lit?	—	Go to Step 9	Go to Step 10
9	1. Repair short to ground in circuit 542. 2. Replace RAP Maxi Fuse. Is action complete?	—	Go to Step 5	—
10	Replace Body Bussed Electrical Center.	—	Go to Step 5	—
11	1. Repair open in circuit 542. Is action complete?	—	Go to Step 5	—
12	1. Repair open in circuit 755. Is action complete?	—	Go to Step 5	—

RAP RELAY WILL NOT RESET WHEN A DOOR JAMB OR DOOR HANDLE SWITCH HAS BEEN ACTIVATED (RAP relay will reset after 20 minutes)

Step	Action	Value(s)	Yes	No
1	1. Connect scan tool to DLC. 2. Monitor the status of door jamb switches, door handle switches, and cargo door switch (if present). 3. Check operation of each switch individually while monitoring the scan tool. Does the scan tool indicate a switch that does not change?	—	Go to step 2	Go to Step 3
2	1. Remove suspect switch, if switch is operating normally look for an open or short to ground in associated wire to TBC (see schematic in section 8D). 2. Repair damaged switch or wire. Is action complete?	—	System OK	—
3	Using the scan tool are there any TBC DTC's set?	—	Go to section 8D	Go to Step 4
4	Replace the TBC Is action complete?	—	System OK	—

RAP ACCESSORIES POWERED AT ALL TIMES

Step	Action	Value(s)	Yes	No
1	Connect scan tool to DLC. Does the scan tool indicate any DTC's in the TBC?	—	Go to Section 8D	Go to Step 2
2	Replace RAP relay. Is action complete?	—	System OK	—

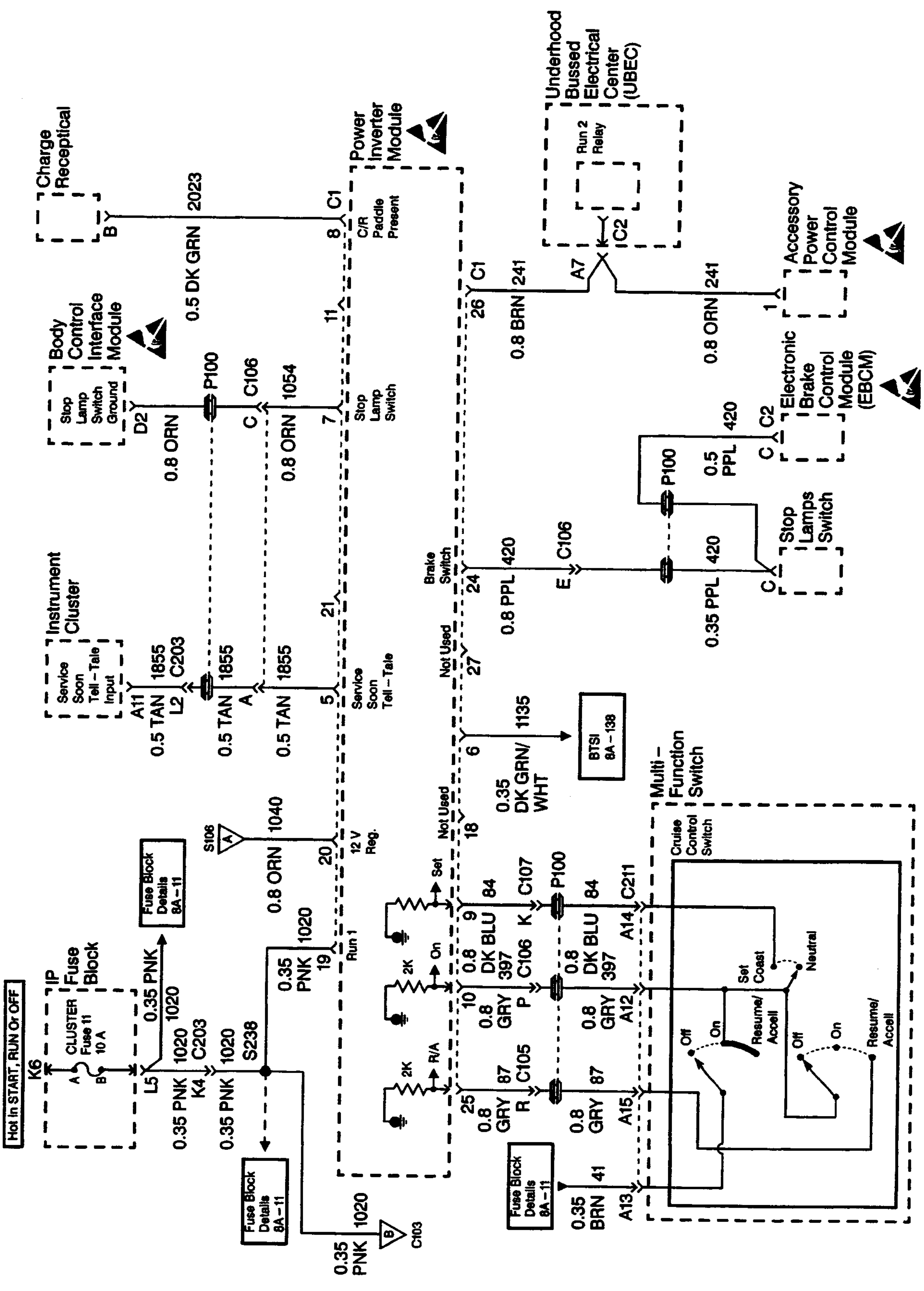
CIRCUIT DESCRIPTION:

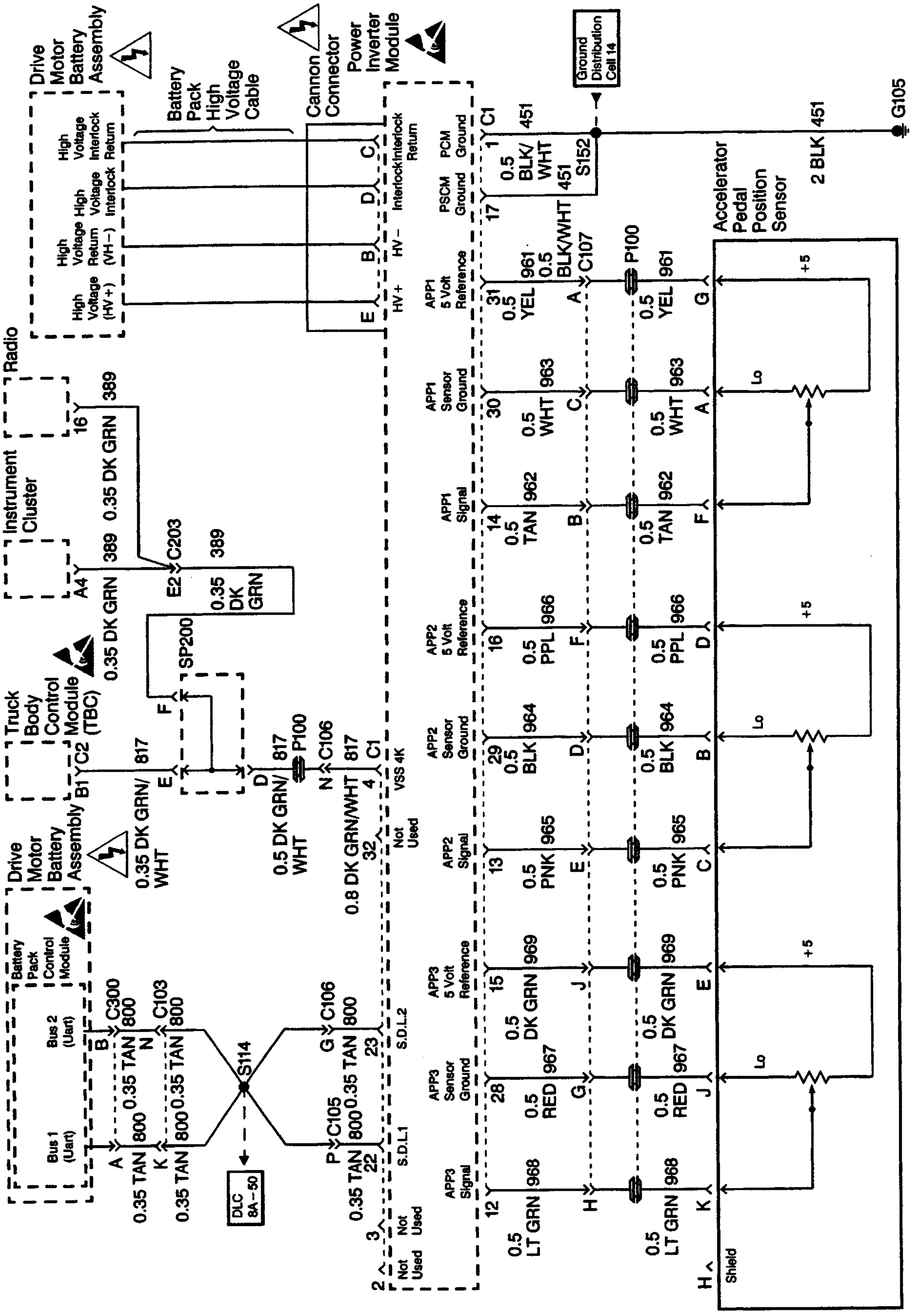
The RETAINED ACCESSORY POWER (RAP) function allows certain accessories such as radio, power windows, overhead console and the sunroof to continue to operate up to 20 minutes after the ignition key is turned to off. The RAP relay which supplies power to the above circuits is energized by the Truck Body Control Module (TBC) by grounding circuit 755. The RAP Relay is energized when the key switch is set to the ON position (Ignition 1 or 3 transitions from inactive to active). The RAP 20 minute time delay starts when the Ignition switch is turned to the OFF position. Once energized, the RAP relay will remain on until any of the following conditions are met:

1. The 20 minute RAP relay delay has elapsed.
2. The driver door/passenger door jamb switch has been activated.
3. A door handle switch has been activated.
4. The cargo door ajar switch (if present) has been activated.
5. The ignition switch is turned to the CRANK position.

DRIVE MOTOR UNIT

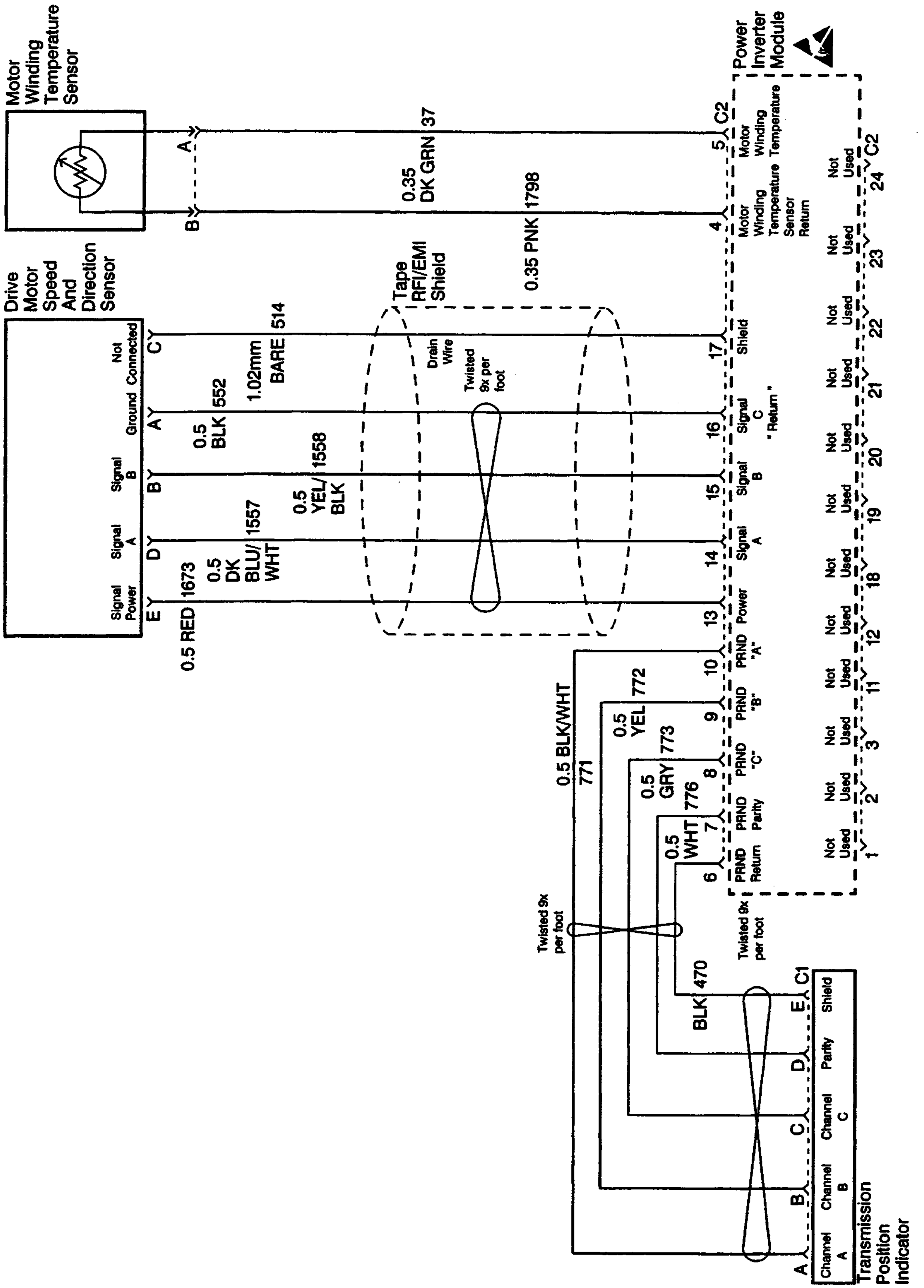
Power Inverter Module


Hot In START, RUN Or OFF
K6
IP Fuse Block
CLUSTER Fuse 11 10 A
A
B
L5
0.35 PNK
1020
Fuse Block Details 8A-11
0.35 PNK K4
1020 C203
0.35 PNK
1020 S238
Fuse Block Details 8A-11
0.35 PNK
1020
B
C103
0.35 PNK
1020
19
Run 1
S106
A
0.8 ORN
1040
20
12 V Reg.
Instrument Cluster
Service Soon Tell-Tale Input
A11
0.5 TAN
1855
L2
C203
0.5 TAN
1855
A
0.5 TAN
1855
5
Service Soon Tell-Tale
21
Body Control Interface Module
Stop Lamp Switch Ground
D2
0.8 ORN
P100
C
C106
0.8 ORN
1054
7
Stop Lamp Switch
11
Charge Receptical
B
0.5 DK GRN
2023
8
C1
C/R Paddle Present
Power Inverter Module
Set
On
R/A
2K
2K
2K
9
0.8 DK BLU
84
C107
K
P100
84
0.8 DK BLU
A14
C211
10
0.8 GRY
397
C106
P
0.8 GRY
397
A12
25
0.8 GRY
87
C105
R
0.8 GRY
87
A15
Fuse Block Details 8A-11
0.35 BRN
41
A13
Not Used
18
6
0.35 DK GRN/ WHT
1135
BTSI 8A-138
Not Used
27
Brake Switch
24
0.8 PPL
420
E
C106
0.35 PPL
420
C
Stop Lamps Switch
P100
0.5 PPL
420
C
C2
Electronic Brake Control Module (EBCM)
26
C1
0.8 BRN
241
A7
K
C2
Run 2 Relay
Underhood Bussed Electrical Center (UBEC)
0.8 ORN
241
1
Accessory Power Control Module
Multi-Function Switch
Cruise Control Switch
Off
On
Resume/ Accell
Set Coast
Neutral
Off
On
Resume/ Accell


Drive Motor Battery Assembly
High Voltage (HV+)
High Voltage Return (VH–)
High Voltage Interlock
High Voltage Interlock Return
Battery Pack High Voltage Cable
Cannon Connector
Power Inverter Module
E
B
D
C
HV+
HV–
Interlock
Interlock Return
Ground Distribution Cell 14
PCM Ground
PSCM Ground
C1
1
17
0.5 BLK/WHT
451
S152
0.5 BLK/WHT
2 BLK
451
G105
Radio
16
389
0.35 DK GRN
Instrument Cluster
A4
389
0.35 DK GRN
E2
C203
389
0.35 DK GRN
SP200
Truck Body Control Module (TBC)
0.35 DK GRN
C2
B1
817
0.35 DK GRN/WHT
E
F
D
817
P100
0.5 DK GRN/WHT
N
C106
817
C1
4
0.8 DK GRN/WHT
32
Not Used
VSS 4K
Drive Motor Battery Assembly
Battery Pack Control Module
Bus 2 (Uart)
Bus 1 (Uart)
B
C300
800
0.35 TAN
N
C103
800
0.35 TAN
A
800
0.35 TAN
K
800
0.35 TAN
S114
DLC 8A–50
G
C106
800
0.35 TAN
23
S.D.L.2
P
C105
800
0.35 TAN
22
S.D.L.1
2
3
Not Used
Not Used
APP1 5 Volt Reference
31
0.5 YEL
961
0.5 BLK/WHT
A
C107
P100
961
0.5 YEL
G
APP1 Sensor Ground
30
0.5 WHT
963
C
963
0.5 WHT
A
APP1 Signal
14
0.5 TAN
962
B
962
0.5 TAN
F
APP2 5 Volt Reference
16
0.5 PPL
966
F
966
0.5 PPL
D
APP2 Sensor Ground
29
0.5 BLK
964
D
964
0.5 BLK
B
APP2 Signal
13
0.5 PNK
965
E
965
0.5 PNK
C
APP3 5 Volt Reference
15
0.5 DK GRN
969
J
969
0.5 DK GRN
E
APP3 Sensor Ground
28
0.5 RED
967
G
967
0.5 RED
J
APP3 Signal
12
0.5 LT GRN
968
H
968
0.5 LT GRN
K
H
Shield
Accelerator Pedal Position Sensor
+5
Lo
+5
Lo
+5
Lo

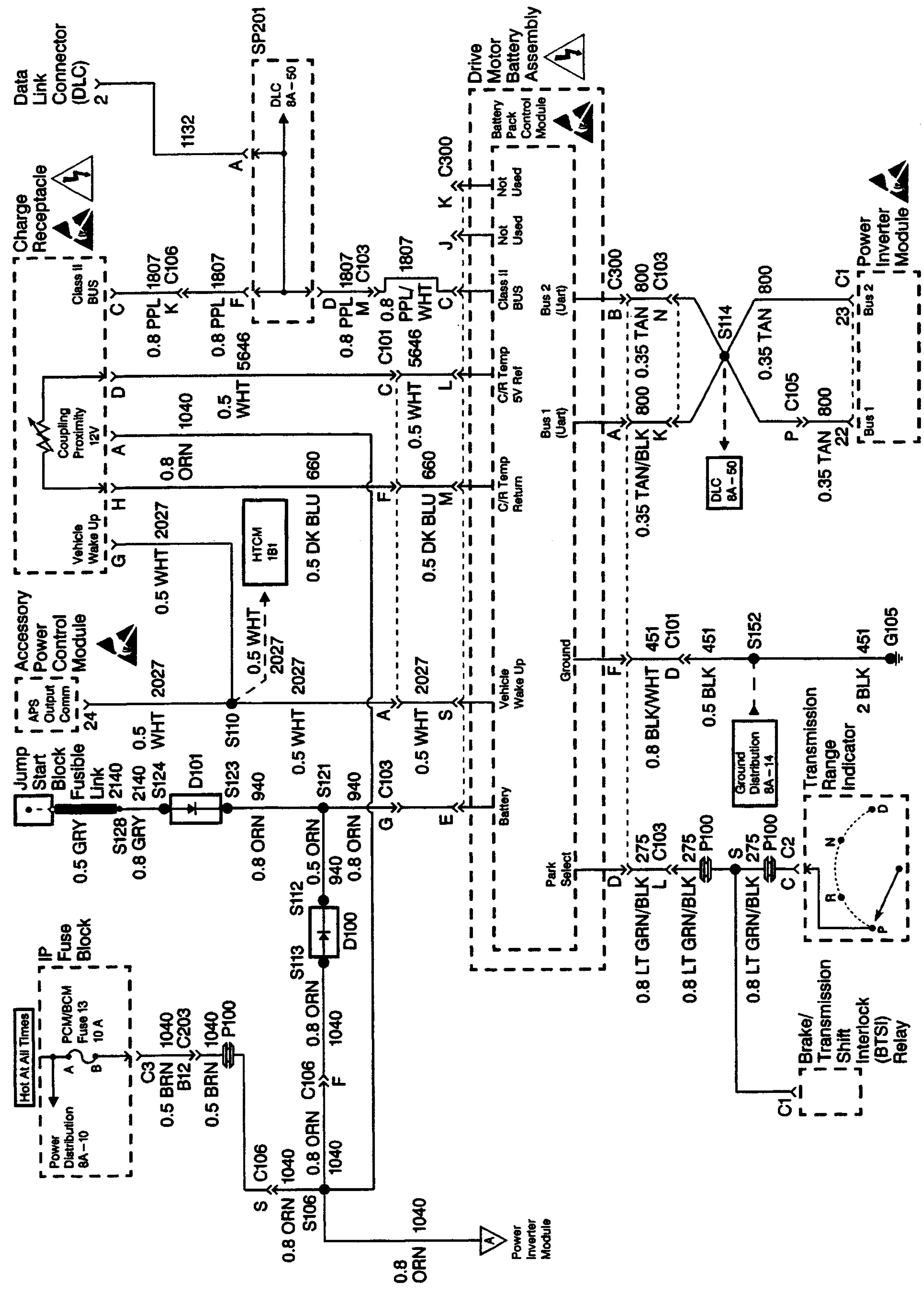
DRIVE MOTOR UNIT

Power Inverter Module


Motor Winding Temperature Sensor
A
B
0.35 DK GRN 37
0.35 PNK 1798
Drive Motor Speed And Direction Sensor
Signal Power
Signal A
Signal B
Ground
Not Connected
E
D
B
A
C
0.5 RED 1673
0.5 DK BLU/ WHT 1557
0.5 YEL/ BLK 1558
0.5 BLK 552
1.02mm BARE 514
Tape RFI/EMI Shield
Drain Wire
Twisted 9x per foot
Power Inverter Module
C2
5
4
17
16
15
14
13
10
9
8
7
6
Motor Winding Temperature
Motor Winding Temperature Sensor Return
Shield
Signal C "Return"
Signal B
Signal A
Power
PRND "A"
PRND "B"
PRND "C"
PRND Parity
PRND Return
Not Used
24
23
22
21
20
19
18
12
11
3
2
1
0.5 BLK/WHT 771
0.5 YEL 772
0.5 GRY 773
0.5 WHT 776
BLK 470
Twisted 9x per foot
Twisted 9x per foot
C1
E
D
C
B
A
Shield
Parity
Channel C
Channel B
Channel A
Transmission Position Indicator

DRIVE MOTOR UNIT

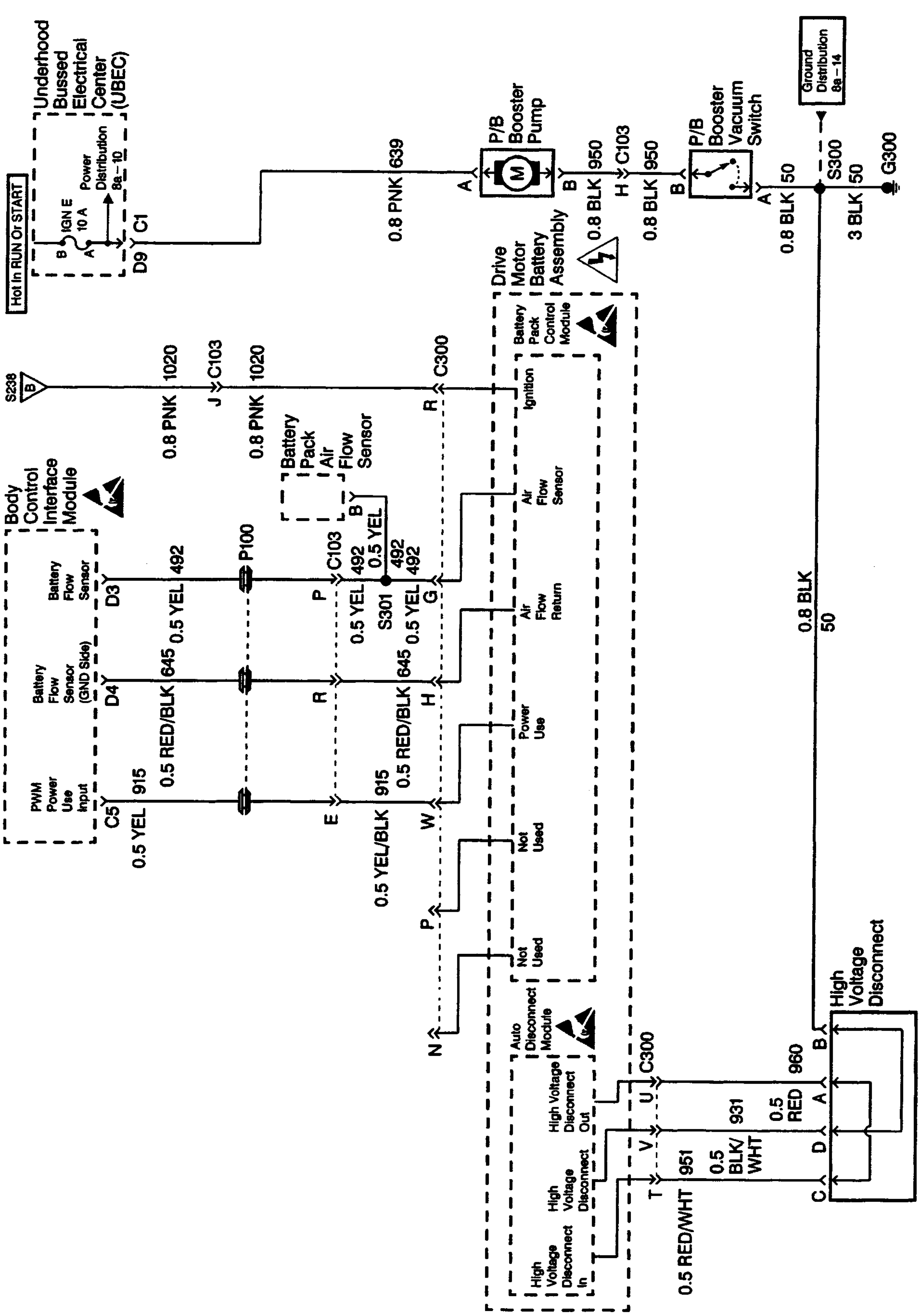
Battery Pack Control Module



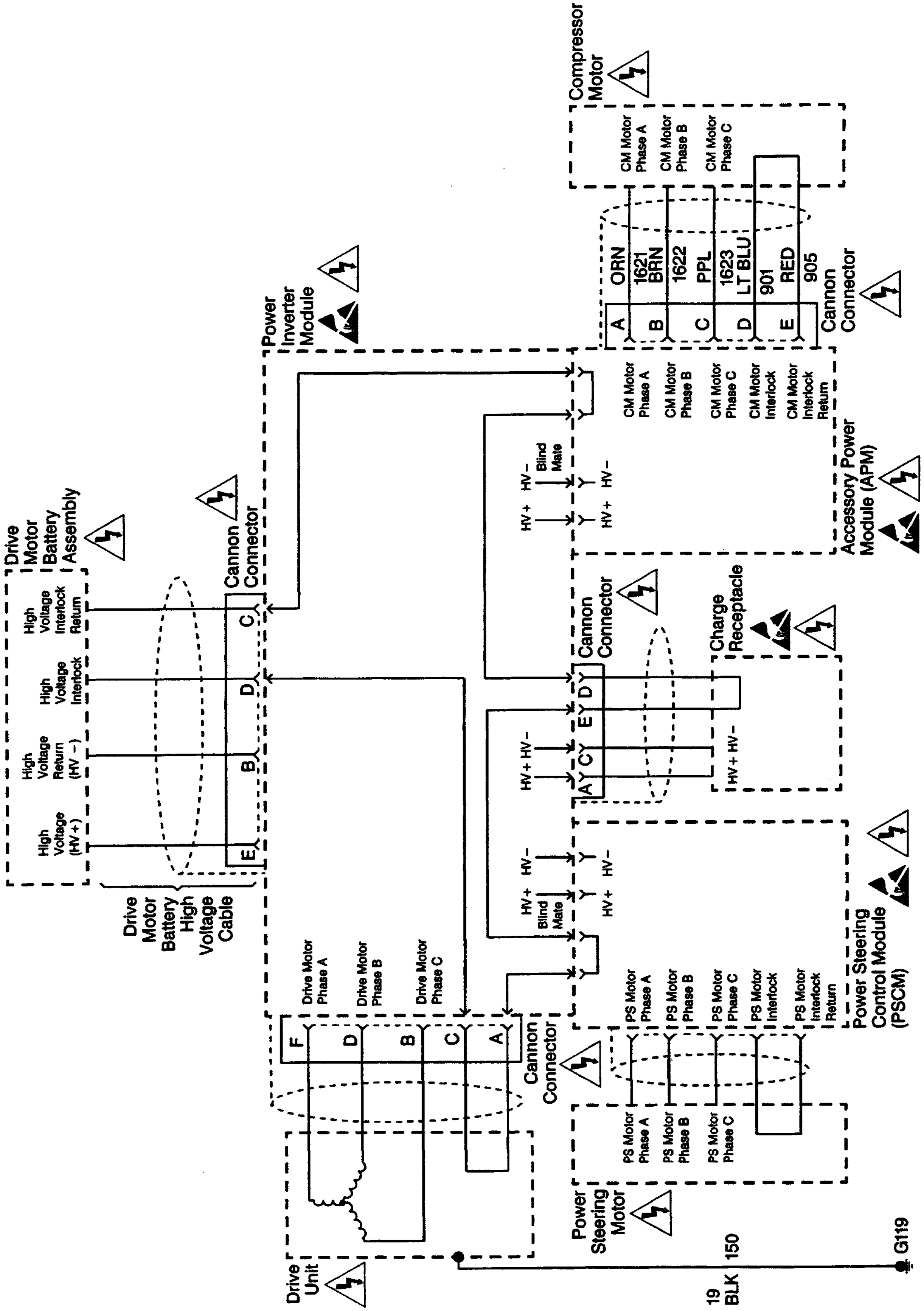
Data Link Connector (DLC)
2
1132
SP201
DLC 8A-50
A
Charge Receptacle
Class II BUS
C
0.8 PPL
1807
K
C106
F
D
M
C103
C101
0.8 PPL/WHT
5646
Coupling Proximity 12V
0.5 WHT
1040
0.8 ORN
660
Vehicle Wake Up
G
H
2027
HTCM 1B1
0.5 DK BLU
Accessory Power Control Module
APS Output Comm
24
S110
Jump Start Block
Fusible Link
2140
0.5 GRY
S128
0.8 GRY
S124
D101
S123
940
0.8 ORN
S121
0.5 ORN
S112
S113
D100
G
E
IP Fuse Block
Hot At All Times
Power Distribution 8A-10
PCM/BCM Fuse 13 10 A
C3
0.5 BRN
B12
C203
P100
C106
S
S106
Power Inverter Module
Drive Motor Battery Assembly
Battery Pack Control Module
C300
K
J
Not Used
Class II BUS
C/R Temp 5V Ref
L
C/R Temp Return
Vehicle Wake Up
Battery
Bus 2 (Uart)
Bus 1 (Uart)
B
800
0.35 TAN
N
S114
0.35 TAN/BLK
DLC 8A-50
Power Inverter Module
C1
Bus 2
23
Bus 1
22
P
C105
Ground
451
0.8 BLK/WHT
0.5 BLK
S152
2 BLK
G105
Ground Distribution 8A-14
Park Select
275
0.8 LT GRN/BLK
Transmission Range Indicator
C2
P
R
N
D
Brake/Transmission Shift Interlock (BTSI) Relay

DRIVE MOTOR UNIT

Battery Pack Control Module


Hot In RUN Or START
Underhood Bussed Electrical Center (UBEC)
IGN E 10 A
B
A
Power Distribution 8a-10
D9
C1
0.8 PNK 639
A
P/B Booster Pump
M
B
0.8 BLK 950
H
C103
0.8 BLK 950
B
P/B Booster Vacuum Switch
A
0.8 BLK 50
S300
3 BLK 50
G300
Ground Distribution 8a-14
Drive Motor Battery Assembly
Battery Pack Control Module
S238
B
0.8 PNK 1020
J
C103
0.8 PNK 1020
R
C300
Ignition
Battery Pack Air Flow Sensor
B
0.5 YEL
Air Flow Sensor
Body Control Interface Module
Battery Flow Sensor
D3
0.5 YEL 492
P100
P
C103
0.5 YEL 492
S301
492
0.5 YEL 492
G
Air Flow Return
Battery Flow Sensor (GND Side)
D4
0.5 RED/BLK 645
R
645
0.5 RED/BLK
H
Power Use
PWM Power Use Input
C5
0.5 YEL 915
E
915
0.5 YEL/BLK
W
Not Used
P
Not Used
N
0.8 BLK 50
Auto Disconnect Module
High Voltage Disconnect Out
High Voltage Disconnect
High Voltage Disconnect In
C300
U
960
0.5 RED
V
931
0.5 BLK/WHT
T
951
0.5 RED/WHT
High Voltage Disconnect
B
A
D
C

DRIVE MOTOR UNIT
High Voltage System


Compressor Motor
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
ORN
1621 BRN
1622 PPL
1623 LT BLU
901 RED
905
A
B
C
D
E
Cannon Connector
Power Inverter Module
CM Motor Phase A
CM Motor Phase B
CM Motor Phase C
CM Motor Interlock
CM Motor Interlock Return
HV+
HV−
Blind Mate
HV+
HV−
Accessory Power Module (APM)
Drive Motor Battery Assembly
High Voltage Interlock Return
High Voltage Interlock
High Voltage Return (HV −)
High Voltage (HV+)
Cannon Connector
C
D
B
E
Drive Motor Battery High Voltage Cable
Cannon Connector
D
E
C
A
HV+ HV−
Charge Receptacle
HV+ HV−
HV+
Blind Mate
HV−
HV+
HV−
Power Steering Control Module (PSCM)
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
PS Motor Interlock
PS Motor Interlock Return
Drive Motor Phase A
Drive Motor Phase B
Drive Motor Phase C
F
D
B
C
A
Cannon Connector
PS Motor Phase A
PS Motor Phase B
PS Motor Phase C
Power Steering Motor
Drive Unit
19 BLK 150
G119

DRIVE MOTOR UNIT

NOTICE: Please refer to SECTION 6 for *Drive Motor Unit* diagnostics.

Drive Motor Unit Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Data Link Connector: 8A-50	8A-50-0
Heater: 8A-60	8A-60-0
HTCM: 8A-64	8A-64-0
Backup Lighting: 8A-112	8A-112-0
Exterior Lighting: 8A-117	8A-117-0
Brake Transmission Shift Interlock: 8A-138	8A-138-0

Drive Motor Unit Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

Drive Motor Unit Component Location Table

Name	Location	201-Pg	Fig.	Conn.
A/C Compressor Motor	Right rear of engine compartment behind (PEB)	2	3	
Accelerator Pedal Position Sensor (APP)	Part of accelerator pedal assembly mounted above accelerator pedal	35	36	52
Accessory Power Control Module (APM)	Mounted to the lower right bottom of the power electronics bay (PEB)	2	3	61
Accessory Power Control Module (APM) Blindmate Connector	Between PEB and APM	2	3	49
Battery Pack Air Flow Sensor	Inside battery thermal module	29	30	2
Battery Pack Control Module	Inside drive motor battery pack assembly			
Battery Pack High Voltage Cable	Connected between right rear of power electronics bay (PEB) and drive motor battery pack	2	3	38
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67

Name	Location	201-Pg	Fig.	Conn.
Charge Receptacle	Behind front license plate	0	1	50
Charge Receptacle High Voltage Cable	Connected between left front of power electronics bay (PEB) and charge receptacle	15	16	39
Cruise Control Switch (Part of Multifunction Switch)	Part of multifunction switch on steering column			
Drive Motor Assembly	In engine compartment below PEB	0	1	
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Drive Motor High Voltage Cable	Connected between middle rear of power electronics bay (PEB) and drive motor assembly	19	20	43
Drive Motor Speed and Direction Sensor	Mounted to LH side of drive motor assembly	22	23	40
Drive Motor Winding Temperature Sensor	Inside drive motor near high voltage cable	23	24	6
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
High Voltage Disconnect	On harness right of brake booster	12	13	35
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
P/B Booster Vacuum Pump	Behind PEB mounted to PEB bracket	2	6	15
P/B Booster Vacuum Switch	On left end of vacuum reserve canister	0	1	15
Power Inverter Module	Inside power electronics bay (PEB)			0
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Power Inverter Module C2	Inside power electronics bay (PEB)	9	10	64
Power Steering Control Module (PSCM)	Attached to lower right of power electronics bay (PEB)	16	17	
Power Steering Control Module (PSCM) Blindmate Connector	Between PEB and PSCM	16	17	51
Power Steering Pump Motor	On right frame rail near PEB	0	1	
Radio C1	Center of IP behind Radio	56	57	56
Run 2 Relay	In relay center	45	46	41
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
Transmission Range Indicator Switch C1	Below drive motor, on left side, near axle	23	24	47
Transmission Range Indicator Switch C2	Below drive motor, on left side, near axle	23	24	31
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
C101	Propulsion harness to body harness,	58	57	96
C103	Chassis harness to propulsion harness, near battery junction block			99
C105	Front body harness to propulsion harness, near P/B booster	12	13	100

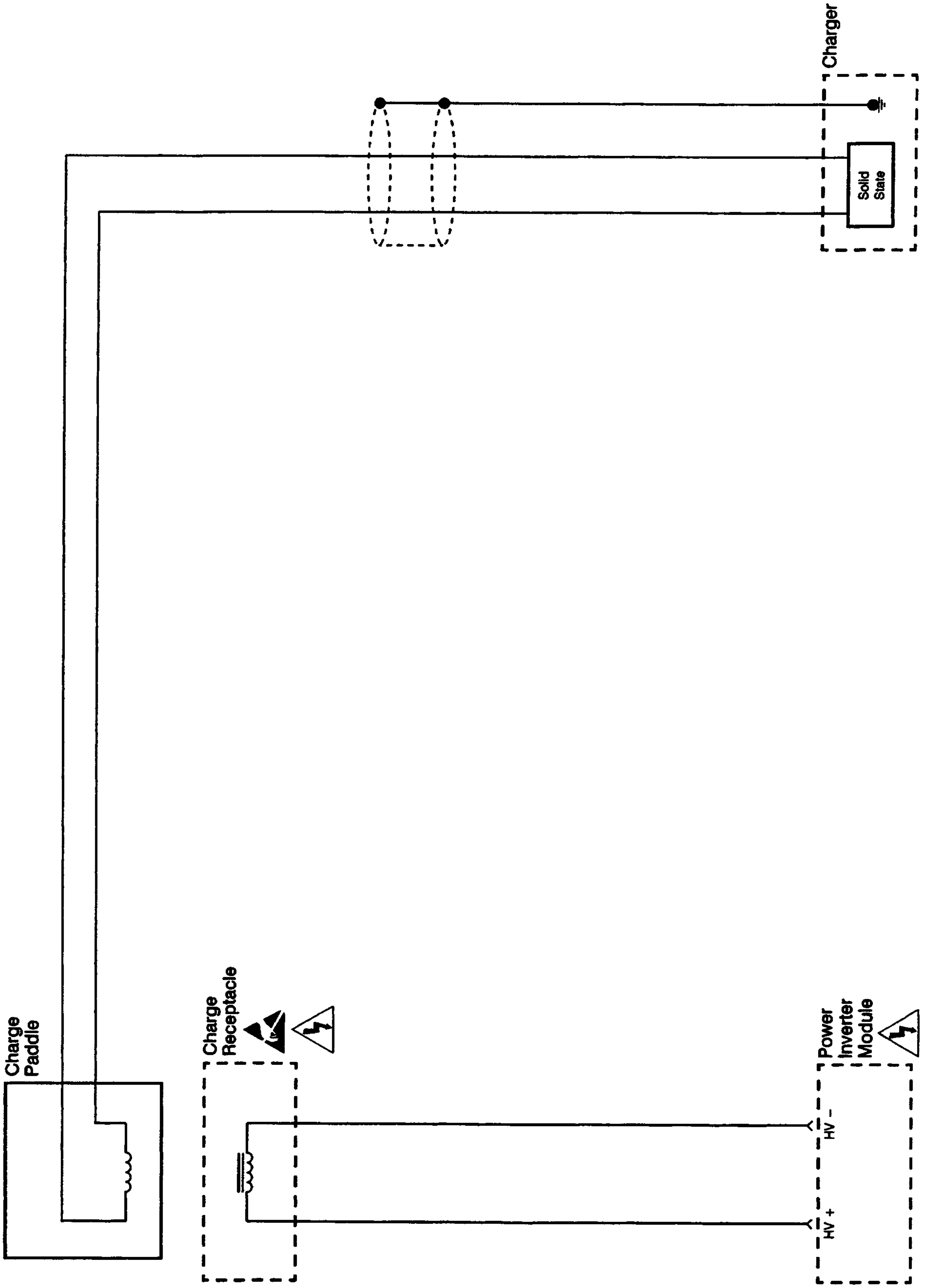
DRIVE MOTOR UNIT

Name	Location	201-Pg	Fig.	Conn.
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C107	Front body harness to propulsion harness, near P/B booster	12	13	98
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
D100	Front body harness 6.5 cm right of blower motor break out			
D101	Front body harness 17.5 cm left of blower motor relay break out			
G105	On top of LH frame rail, near windshield washer bottle			
G114	MOunted to A/C compressor	26	27	
G300	Left middle of vehicle on top of frame above front leaf spring mount			
P100	Below brake master cylinder at bulkhead	25	26	
S106	Propulsion harness, approximately 25 cm left of power steering pump breakout			
S110	Propulsion harness, approximately 15 cm left of inverter module breakout			
S112	Propulsion harness, on D100			
S113	Propulsion harness, on D100			
S121				
S123	Propulsion harness, on D101			
S124	Propulsion harness, on D101			
S128	Front body harness, approximately 16 cm from jump start block eyelet			
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
S238				
S300				
SP201	Behind IP cluster			
SP202	Behind IP cluster			
SP204		63	64	

BLANK

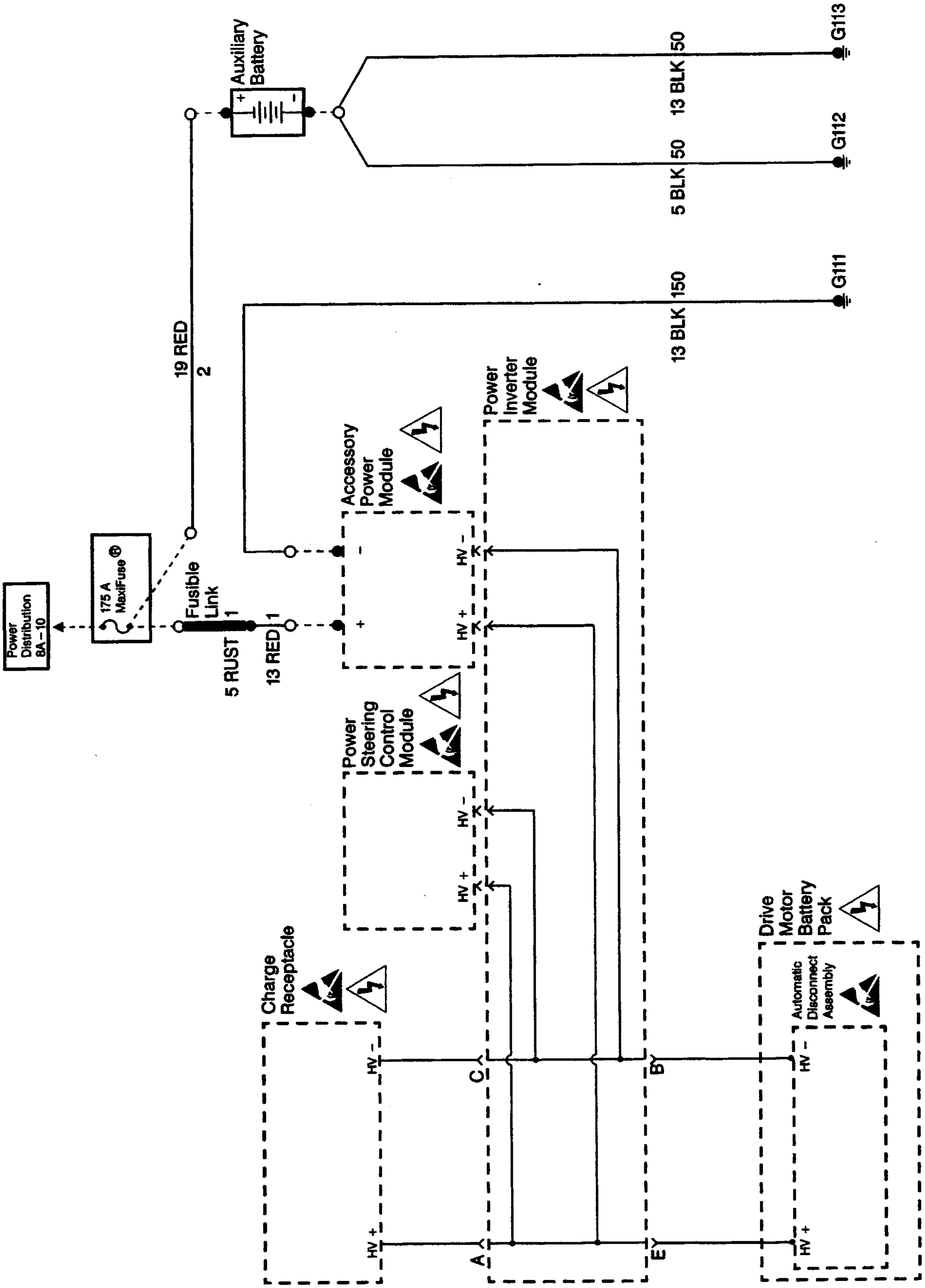
CHARGING SYSTEM

Charger


Charger
Solid State
Charge Paddle
Charge Receptacle
Power Inverter Module
HV –
HV +

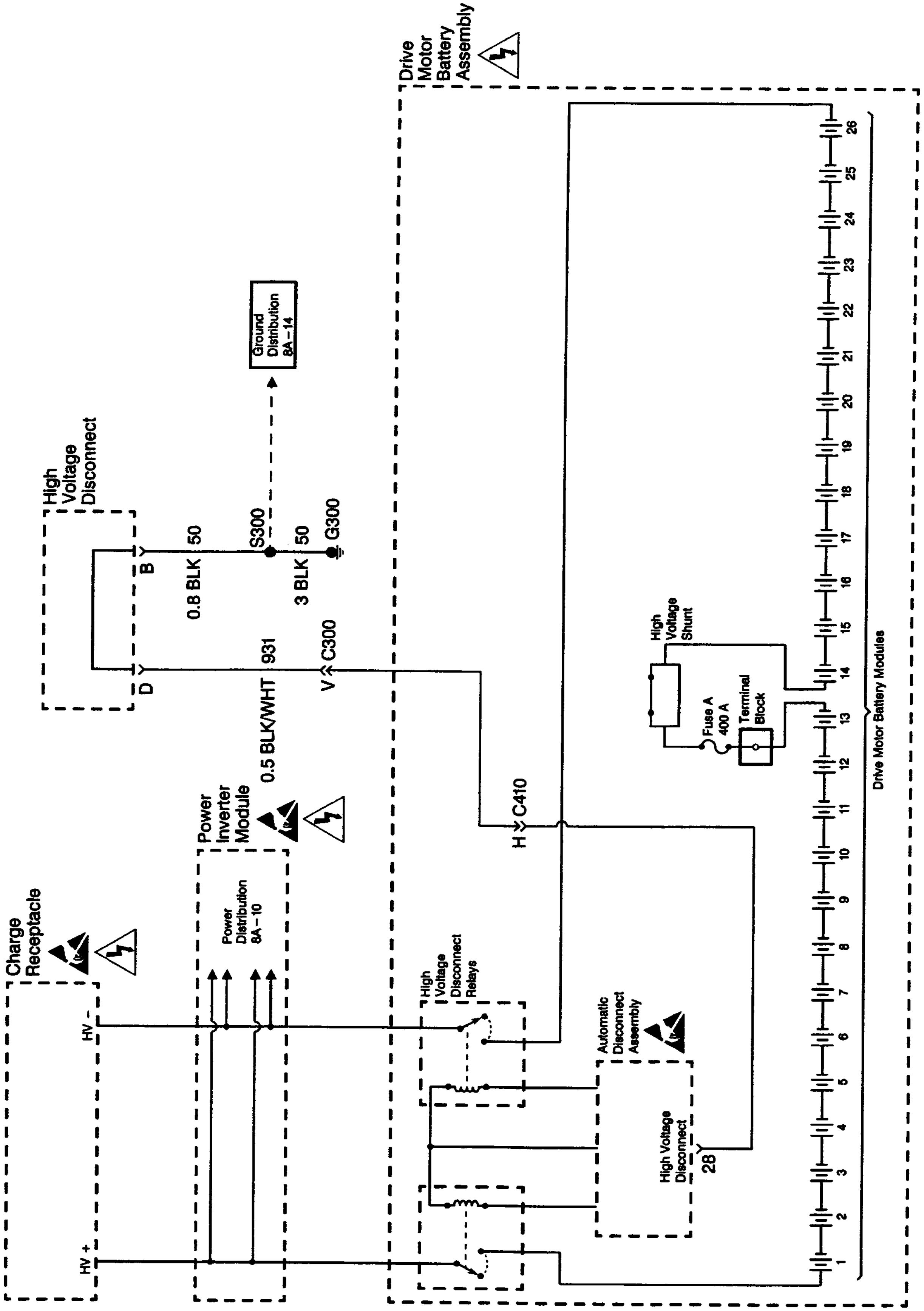
CHARGING SYSTEM

Auxiliary Battery Charging System


Auxiliary Battery
+
-
13 BLK 50
G113
5 BLK 50
G112
13 BLK 150
G111
19 RED
2
Power Inverter Module
Accessory Power Module
Fusible Link
1
5 RUST
13 RED
1
175 A MaxiFuse®
Power Distribution 8A-10
HV -
HV +
Power Steering Control Module
HV -
HV +
Charge Receptacle
HV -
HV +
C
A
B
E
Drive Motor Battery Pack
Automatic Disconnect Assembly
HV -
HV +

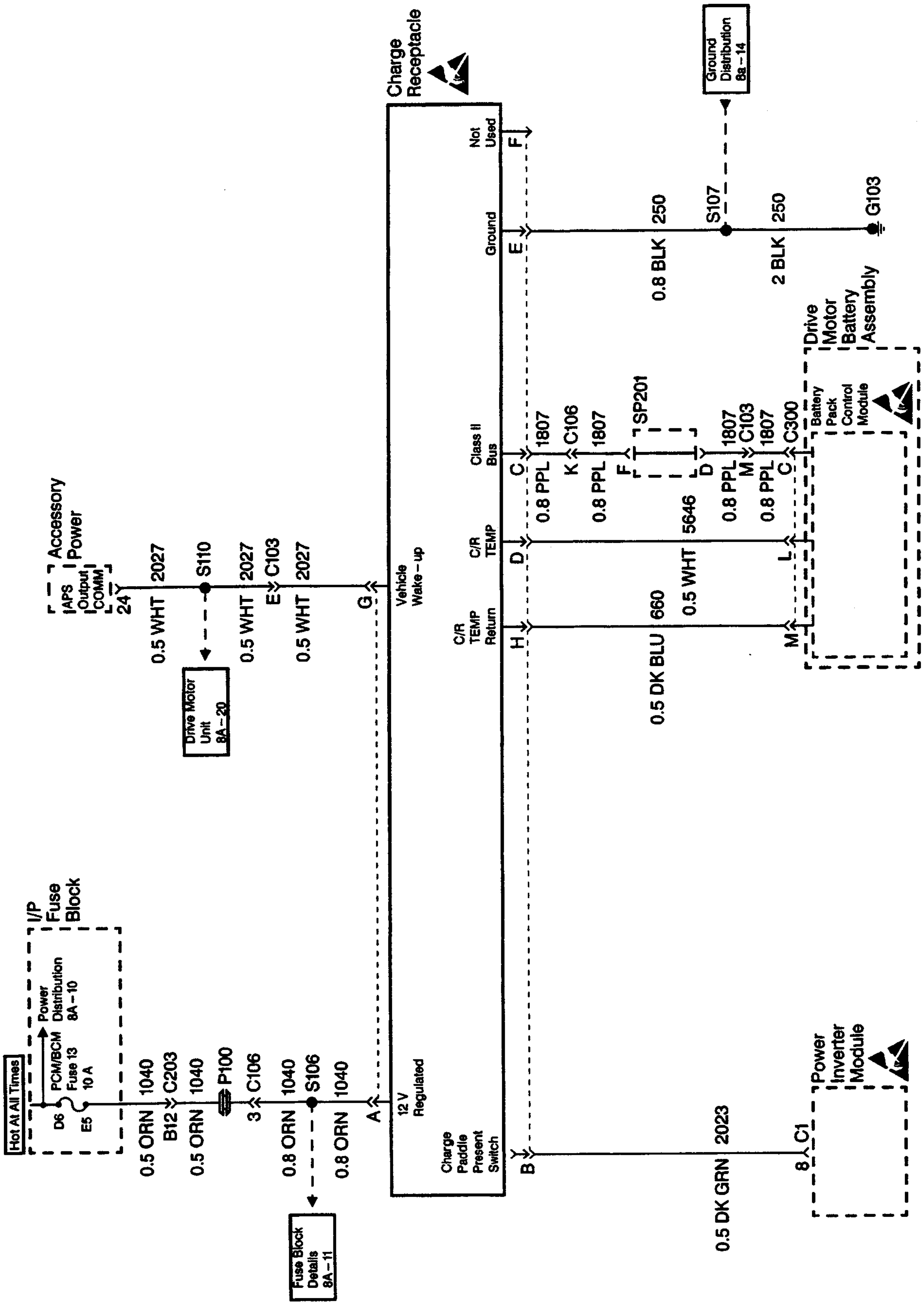
CHARGING SYSTEM

High Voltage Battery Charging System


Drive Motor Battery Assembly
Ground Distribution 8A-14
High Voltage Disconnect
B
D
0.8 BLK
50
S300
3 BLK
50
G300
931
0.5 BLK/WHT
V
C300
H
C410
Power Inverter Module
Power Distribution 8A-10
Charge Receptacle
HV -
HV +
High Voltage Disconnect Relays
Automatic Disconnect Assembly
High Voltage Disconnect
28
High Voltage Shunt
Fuse A 400 A
Terminal Block
Drive Motor Battery Modules
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

CHARGING SYSTEM

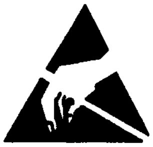
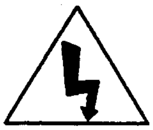
Charge Receptacle Low Voltage System


Hot At All Times
I/P Fuse Block
PCM/BCM Fuse 13 10 A
D6
E5
Power Distribution 8A-10
0.5 ORN 1040
B12 C203
0.5 ORN 1040
P100
3 C106
0.8 ORN 1040
S106
0.8 ORN 1040
Fuse Block Details 8A-11
A
12 V Regulated
Charge Paddle Present Switch
B
0.5 DK GRN 2023
8 C1
Power Inverter Module
Accessory Power
APS Output COMM
24
0.5 WHT 2027
S110
Drive Motor Unit 8A-20
0.5 WHT 2027
E C103
0.5 WHT 2027
G
Vehicle Wake-up
Charge Receptacle
Not Used
F
Ground
E
0.8 BLK 250
S107
Ground Distribution 8a-14
2 BLK 250
G103
Class II Bus
C
0.8 PPL 1807
K C106
0.8 PPL 1807
F
SP201
D
0.8 PPL 1807
M C103
0.8 PPL 1807
C C300
C/R TEMP
D
5646
0.5 WHT
L
C/R TEMP Return
H
0.5 DK BLU 660
M
Drive Motor Battery Assembly
Battery Pack Control Module

Charging System Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0
Fuse Block Details: 8A-11	8A-11-0
Drive Motor Unit: 8A-20	8A-20-0
Data Link Connector: 8A-50	8A-50-0

Charging System Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

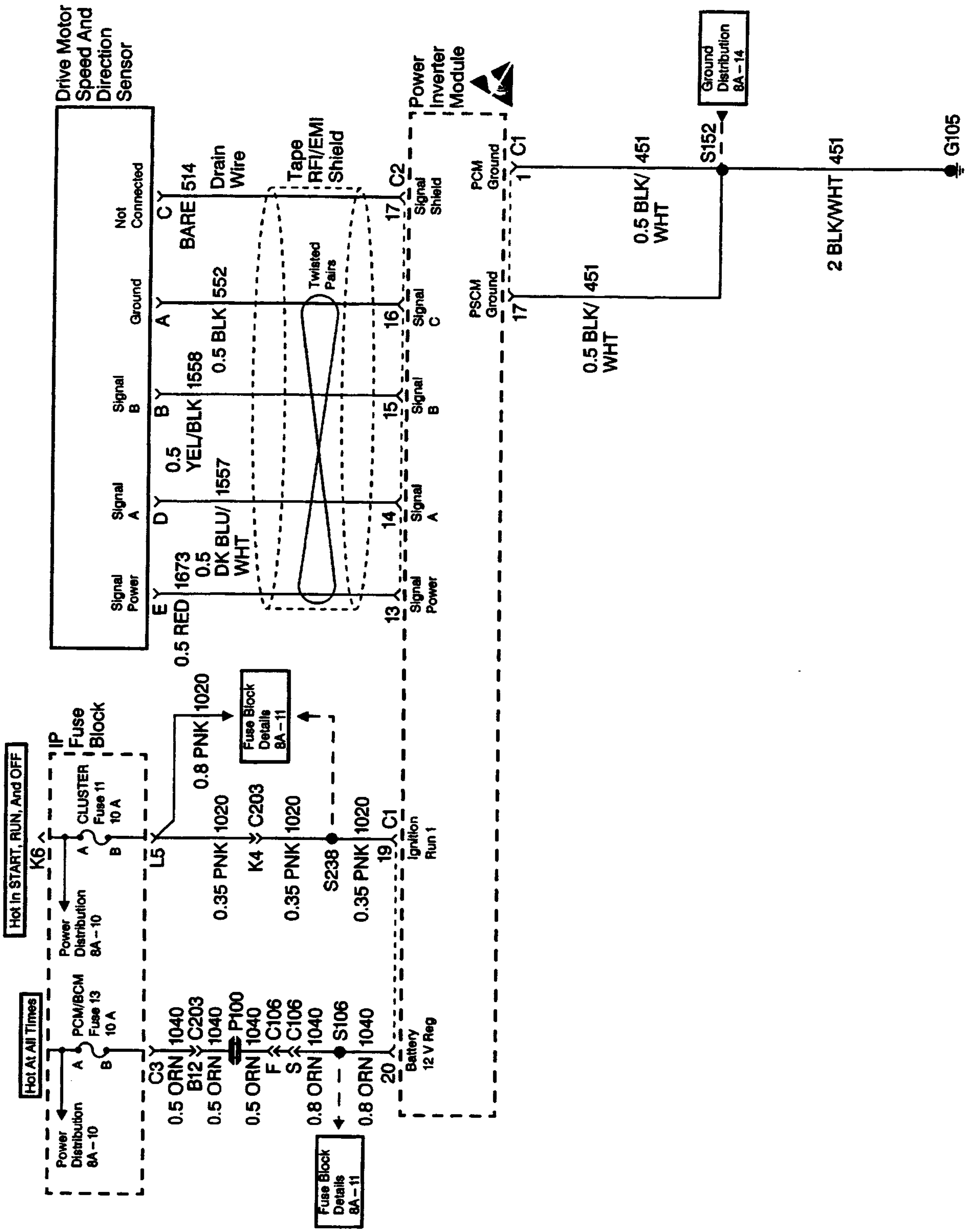
Charging System Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Accessory Power Control Module (APM)	Mounted to the lower right bottom of the power electronics bay (PEB)	2	3	61
Accessory Power Control Module (APM) Blindmate Connector	Between PEB and APM	2	3	49
Accessory Power Control Module (APM) Negative Cable	At left rear of APM near bottom	2	3	
Accessory Power Control Module (APM) Positive Cable	At left rear of APM near bottom	2	3	
Automatic Disconnect Module	Inside drive motor battery pack assembly			74
Auxiliary Battery	At right front corner of engine compartment	1	2	
Auxiliary Battery Negative Cable	Between auxiliary battery and RH frame rail	1	2	
Auxiliary Battery Positive Cable	Between auxiliary battery and mega fuse	1	2	
Battery Pack Control Module	Inside drive motor battery pack assembly			
Charge Receptacle	Behind front license plate	0	1	50
Charge Receptacle High Voltage Cable	Connected between left front of power electronics bay (PEB) and charge receptacle	15	16	39
Drive Motor Battery	In battery pack assembly	0	1	
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	

Name	Location	201-Pg	Fig.	Conn.
High Voltage Disconnect	On harness right of brake booster	12	13	35
High Voltage Disconnect Relay—K1	Inside drive motor battery pack assembly			10
High Voltage Disconnect Relay—K2	Inside drive motor battery pack assembly			11
IP Fuse Block	LH side of instrument panel	33	34	76
Power Inverter Module	Inside power electronics bay (PEB)			0
Power Steering Control Module (PSCM)	Attached to lower right of power electronics bay (PEB)	16	17	
Power Steering Control Module (PSCM) Blindmate Connector	Between PEB and PSCM	16	17	51
C103	Chassis harness to propulsion harness, near battery junction block			99
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
G103	On top of RH frame rail, near auxiliary battery	5	6	
G300	Left middle of vehicle on top of frame above front leaf spring mount			
P100	Below brake master cylinder at bulkhead	25	26	
S106	Propulsion harness, approximately 25 cm left of power steering pump breakout			
S107	Propulsion harness, approximately 5 cm left of inverter module breakout			
S110	Propulsion harness, approximately 15 cm left of inverter module breakout			
S300				
SP201	Behind IP cluster			

NOTICE: Please refer to SECTION 6 for *Charging System* diagnostics.

VEHICLE SPEED SENSOR


Hot At All Times
Power Distribution 8A-10
PCM/BCM Fuse 13 10 A
A
B
Hot In START, RUN, And OFF
K6
Power Distribution 8A-10
CLUSTER Fuse 11 10 A
IP Fuse Block
C3
0.5 ORN 1040
B12 C203
0.5 ORN 1040
P100
0.5 ORN 1040
F C106
S C106
0.8 ORN 1040
S106
0.8 ORN 1040
Fuse Block Details 8A-11
20
Battery 12 V Reg
L5
0.35 PNK 1020
0.8 PNK 1020
K4 C203
0.35 PNK 1020
S238
0.35 PNK 1020
Fuse Block Details 8A-11
19
C1
Ignition Run 1
Drive Motor Speed And Direction Sensor
Signal Power
Signal A
Signal B
Ground
Not Connected
E
D
B
A
C
0.5 RED 1673
0.5 DK BLU/WHT 1557
0.5 YEL/BLK 1558
0.5 BLK 552
BARE 514
Drain Wire
Tape RFI/EMI Shield
Twisted Pairs
13 Signal Power
14 Signal A
15 Signal B
16 Signal C
17 Signal Shield
C2
Power Inverter Module
PSCM Ground 17
PCM Ground 1
C1
0.5 BLK/WHT 451
0.5 BLK/WHT 451
S152
Ground Distribution 8A-14
2 BLK/WHT 451
G105

Vehicle Speed Sensor Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0
Fuse Block Details: 8A-11	8A-11-0

Vehicle Speed Sensor Schematic Icon Table

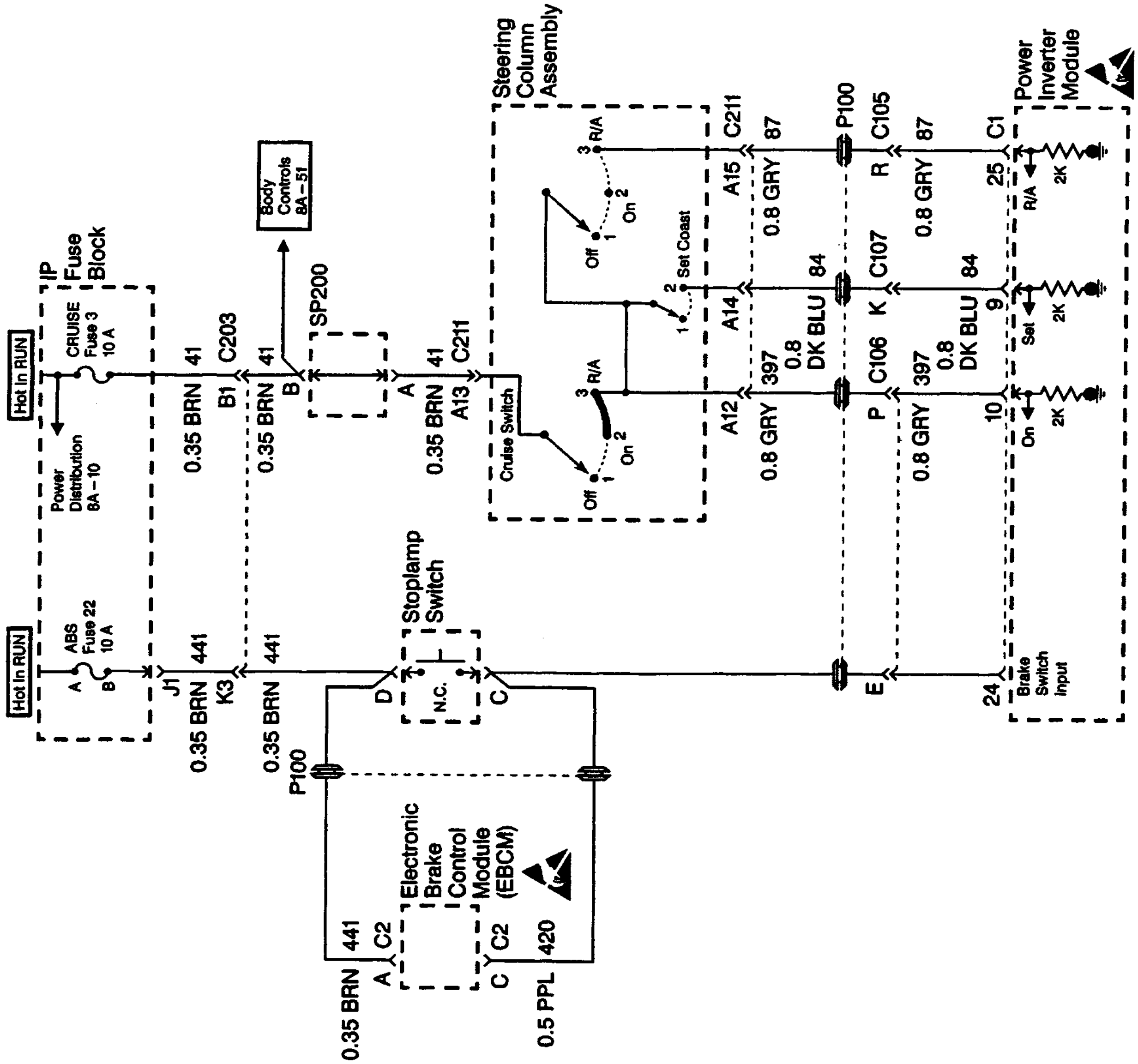
Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A−3−0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Vehicle Speed Sensor Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Drive Motor Speed and Direction Sensor	Mounted to LH side of drive motor assembly	22	23	40
IP Fuse Block	LH side of instrument panel	33	34	76
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Power Inverter Module C2	Inside power electronics bay (PEB)	9	10	64
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
G105	On top of LH frame rail, near windshield washer bottle			
P100	Below brake master cylinder at bulkhead	25	26	
S106	Propulsion harness, approximately 25 cm left of power steering pump breakout			
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
S238				

NOTICE: Please refer to SECTION 6 for *Vehicle Speed Sensor* diagnostics.

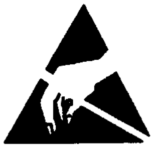
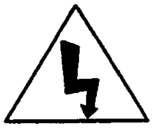
CRUISE CONTROL


Hot In RUN
Hot In RUN
IP Fuse Block
CRUISE Fuse 3 10 A
ABS Fuse 22 10 A
Power Distribution 8A-10
A
B
J1
0.35 BRN 441
K3
0.35 BRN 441
0.35 BRN 41
C203
B1
SP200
Body Controls 8A-51
0.35 BRN 41
A
A13
C211
Steering Column Assembly
Cruise Switch
Off 1
On 2
3 R/A
1
2 Set Coast
A12
A14
A15
C211
0.8 GRY 397
0.8 DK BLU 84
0.8 GRY 87
P100
C106
C107
C105
P
K
R
E
0.8 GRY 397
0.8 DK BLU 84
0.8 GRY 87
10
9
25
24
C1
Power Inverter Module
On
Set
R/A
2K
2K
2K
Brake Switch Input
Stoplamp Switch
N.C.
D
C
P100
Electronic Brake Control Module (EBCM)
441
C2
A
0.35 BRN
420
C2
C
0.5 PPL

Cruise Control Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-51	8A-51-0

Cruise Control Schematic Icon Table

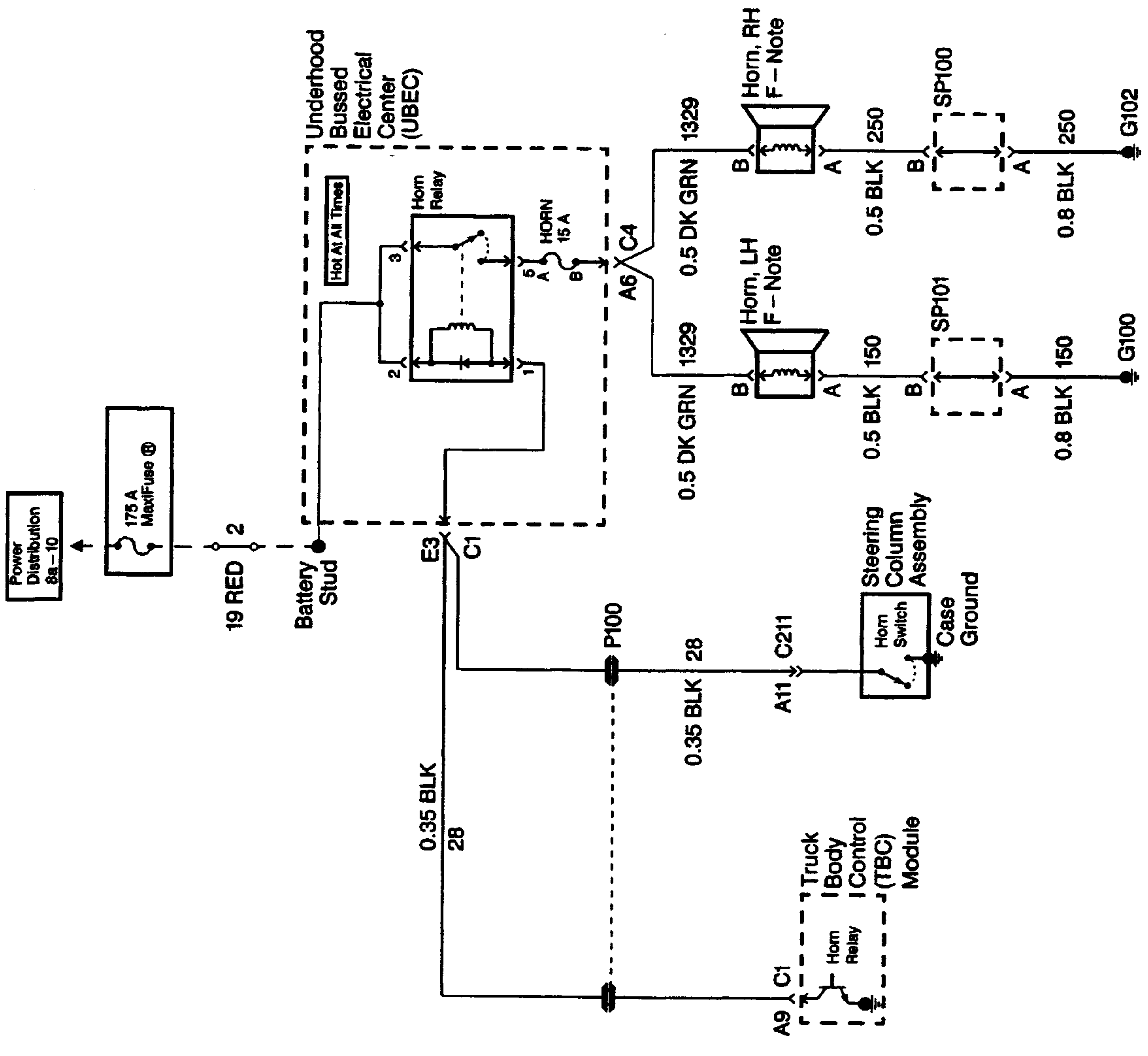
Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

Cruise Control Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Cruise Control Switch (Part of Multifunction Switch)	Part of multifunction switch on steering column			
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
IP Fuse Block	LH side of instrument panel	33	34	76
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
C105	Front body harness to propulsion harness, near P/B booster	12	13	100
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C107	Front body harness to propulsion harness, near P/B booster	12	13	98
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
P100	Below brake master cylinder at bulkhead	25	26	
SP200	Behind IP cluster			

NOTICE: Please refer to SECTION 6 for *Cruise Control* diagnostics.

HORN(S)


Power Distribution 8a-10
175 A MaxiFuse ®
19 RED
2
Battery Stud
Underhood Bussed Electrical Center (UBEC)
Hot At All Times
Horn Relay
3
2
1
5
A
B
HORN 15 A
C4
A6
E3
C1
0.5 DK GRN
1329
0.5 DK GRN
1329
B
A
Horn, RH F-Note
Horn, LH F-Note
0.5 BLK
250
0.5 BLK
150
B
A
SP100
SP101
0.8 BLK
250
0.8 BLK
150
G102
G100
0.35 BLK
28
P100
0.35 BLK
28
C211
A11
Steering Column Assembly
Horn Switch
Case Ground
Truck Body Control (TBC) Module
Horn Relay
C1
A9

HORN(S)

Horn(s) Schematic Reference Table

Reference on Schematic	Location
Fuse Block Details: 8A-11	8A-11-0
Power Distribution: 8A-10	8A-10-0

Horn(s) Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Horn Relay	In underhood bused electrical center	45	46	35
Horn Switch	Behind pad in steering wheel	48	49	
Horn, LH	in LH fender behind washer bottle	4	5	11
Horn, RH	In RH fender near auxiliary battery	4	5	12
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
G100	Left front of vehicle mounted to radiator core support by LH headlamp	4	5	
G102	On right front of vehicle, mounted to radiator core support, by RH headlamp	4	5	
SP100	Left front of vehicle mounted to radiator support			
SP101	Right front of vehicle mounted to radiator support	62	63	

Horn(s) Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Activate horn by pressing horn pad.	Both horns sound.	• *Horn Sounds Continuously* • *Both Horns Inoperative* • *One Horn Inoperative.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

Horn Sounds Continuously

Step	Action	Value(s)	Yes	No
1	Remove horn relay from underhood bussed electrical center (UBEC). Did the horns stop sounding?	—	Go to *Step* *3*	Go to *Step* *2*
2	Locate and repair short to voltage in CKT 1329 (DK GRN) wire between horn relay and horns. Did you complete the wire repair?	—	System OK	—
3	Connect a test light between terminals 1 and 2 in the horn relay socket. Did the test lamp light?	—	Go to *Step* *5*	Go to *Step* *4*

HORN(S)

Step	Action	Value(s)	Yes	No
4	Replace the horn relay. Did you complete the horn relay replacement?	—	System OK	—
5	1. Disconnect the horn switches. 2. Connect a test light between terminals 1 and 2 in the horn relay socket. Did the test lamp light?	—	Go to *Step 7*	Go to *Step 6*
6	Locate and repair short to ground in CKT 28 (BLK) wire between horn relay and horn switch. Did you complete the wire repair?	—	System OK	—
7	1. Disconnect the truck body control module (TBC). 2. Connect a test light between terminals 1 and 2 in the horn relay socket. Did the test lamp light?	—	Go to *Step 8*	Go to *Step 9*
8	Locate and repair short to ground in CKT 28 (BLK) wire between horn relay and horn switch or TBC. Did you complete the wire repair?	—	System OK	—
9	Replace the truck body control module. Did you complete the horn switch replacement?	—	Refer to *Section 8D* Truck Body Control Module for replacement procedures.	—

Both Horns Inoperative

Step	Action	Value(s)	Yes	No
1	Inspect the HORN fuse. Is the HORN fuse open?	—	Go to *Step 2*	Go to *Step 3*
2	Locate and repair short to ground in CKT 1329 (DK GRN) wire or horns. Did you complete the repair?	—	System OK	—
3	1. Remove horn relay from underhood bussed electrical center (UBEC). 2. Connect a test lamp between ground and CKT 42 in cavities 2 and 3 of horn relay socket. Did the test lamp light in both positions?	—	Go to *Step 5*	Go to *Step 4*
4	Replace underhood bussed electrical center (UBEC). Did you complete the underhood bussed electrical center (UBEC) replacement?	—	System OK	—
5	1. Connect a test light between terminals 1 and 2 in the horn relay socket. 2. Press the horn button. Did the test lamp light?	—	Go to *Step 9*	Go to *Step 6*

HORN(S)

Step	Action	Value(s)	Yes	No
6	1. Connect a self-powered test light between CKT 28 (BLK) wire cavity A11 in C211 and ground. 2. Press the horn button. Did the test lamp light?	—	Go to *Step 8*	Go to *Step 7*
7	Replace the horn switch. Did you complete the horn switch replacement?	—	System OK	—
8	Locate and repair open in CKT 28 (BLK) wire between horn relay and C211. Did you complete the wire repair?	—	System OK	—
9	Connect a fused jumper between cavities 3 and 5 of horn relay socket. Did the horn sound?	—	Go to *Step 10*	Go to *Step 11*
10	Replace horn relay. Did you complete the horn relay replacement?	—	System OK	—
11	1. Disconnect both horns. 2. Connect a fused jumper between cavities 3 and 5 of horn relay socket. 3. Connect a test lamp between ground and terminal A of each horn. Did the test lamp light?	—	Go to *Step 13*	Go to *Step 12*
12	Locate and repair open CKT 1329 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
13	Connect a self-powered test lamp between CKT 150/250 (BLK) wire cavity A at each horn and ground. Did the test lamp light at both connectors?	—	Go to *Step 14*	Go to *Step 15*
14	Replace both horns. Did you complete the horn replacement?	—	System OK	—
15	Repair horn grounds. Did you complete the ground repair?	—	System OK	—

One Horn Inoperative

Step	Action	Value(s)	Yes	No
1	1. Disconnect inoperative horn. 2. Connect a test lamp between CKT 1329 (DK GRN) wire and ground. 3. Press horn button. Did the test lamp light?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open CKT 1329 (DK GRN) wire between underhood bussed electrical center (UBEC) cavity A6 and inoperative horn. Did you complete the wire repair?	—	System OK	—
3	Connect a self-powered test lamp between CKT 150/250 (BLK) wire and ground at inoperative horn. Did the test lamp light?	—	Go to *Step 4*	Go to *Step 5*

HORN(S)

Step	Action	Value(s)	Yes	No
4	Replace inoperative horn. Did you complete the horn relay replacement?	—	System OK	—
5	Locate and repair open in CKT 150/250 (BLK) wire. Did you complete the ground repair?	—	System OK	—

CIRCUIT OPERATION

Battery voltage is available at all times to the horn relay at terminals 2 and 3.

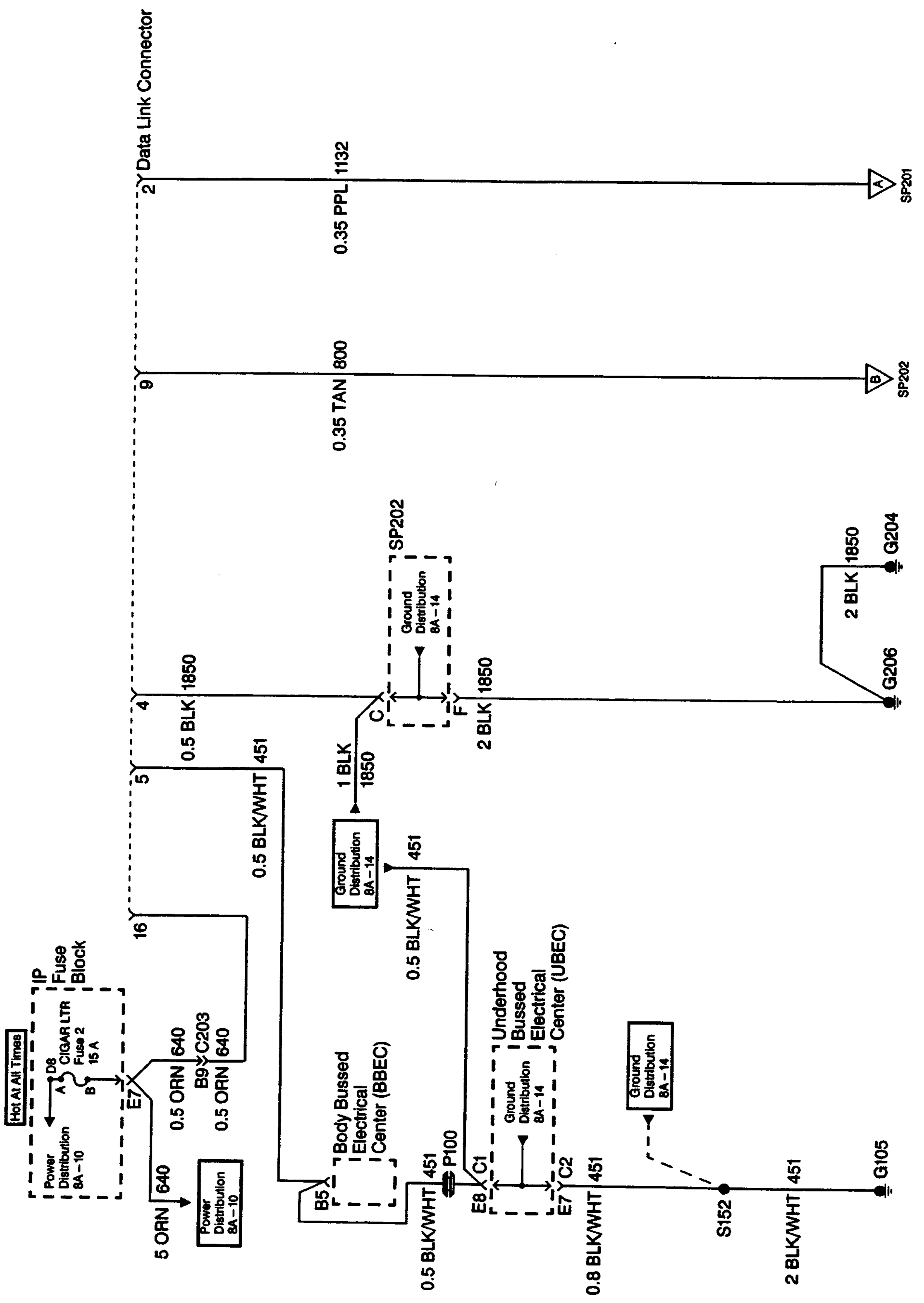
When the horn switch is pressed it provides a ground to the horn relay coil 1 cavity.

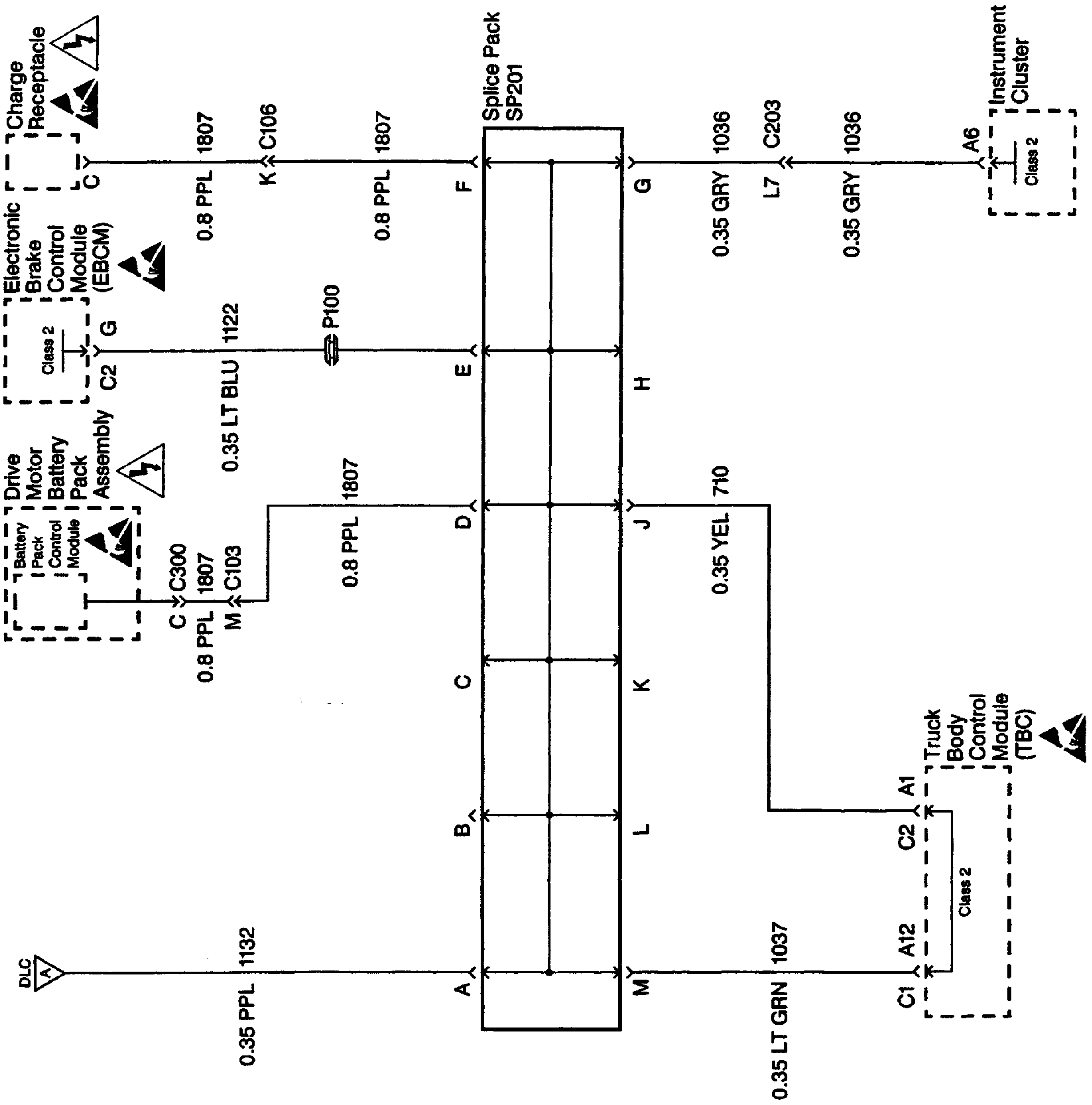
When the horn relay is energized, the relay contacts close, applying battery voltage to the horns.

The horns continue to sound until the horn switch is released.

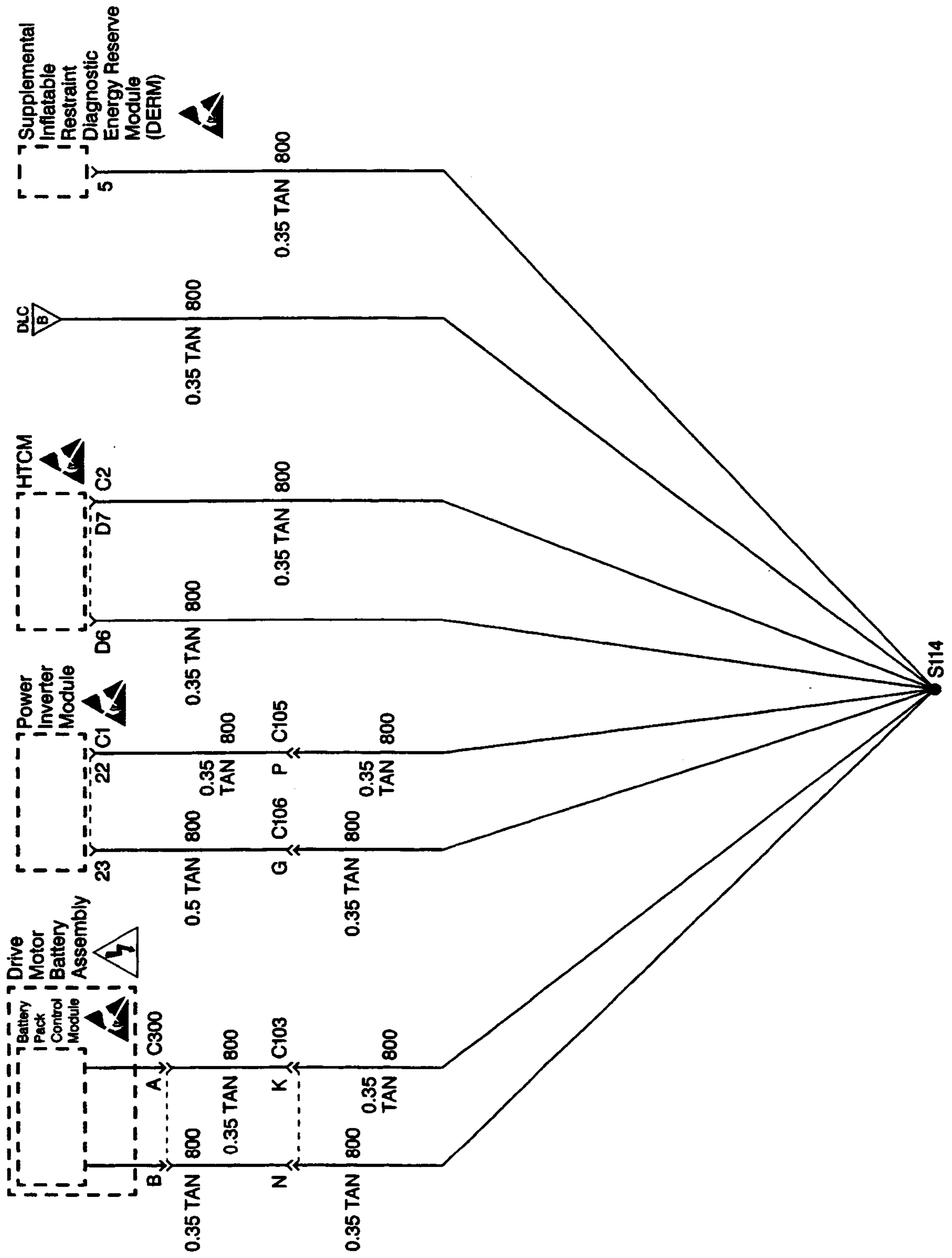
BLANK

DATA LINK CONNECTOR (DLC)


Data Link Connector
2
0.35 PPL 1132
A
SP201
9
0.35 TAN 800
B
SP202
4
0.5 BLK 1850
SP202
Ground Distribution 8A-14
C
F
2 BLK 1850
1 BLK 1850
2 BLK 1850
G204
G206
5
0.5 BLK/WHT 451
Ground Distribution 8A-14
0.5 BLK/WHT 451
16
Hot At All Times
IP Fuse Block
D8
A
CIGAR LTR Fuse 2 15 A
B
Power Distribution 8A-10
E7
640
C203
B9
0.5 ORN 640
0.5 ORN
5 ORN 640
Power Distribution 8A-10
Body Bussed Electrical Center (BBEC)
B5
451
P100
0.5 BLK/WHT
E8
C1
Underhood Bussed Electrical Center (UBEC)
Ground Distribution 8A-14
C2
E7
451
0.8 BLK/WHT
Ground Distribution 8A-14
S152
2 BLK/WHT 451
G105


Charge Receptacle
C
0.8 PPL 1807
K C106
0.8 PPL 1807
F
Electronic Brake Control Module (EBCM)
Class 2
G
C2
0.35 LT BLU 1122
P100
E
Drive Motor Battery Pack Assembly
Battery Pack Control Module
C C300
0.8 PPL 1807
M C103
0.8 PPL 1807
D
C
B
DLC
A
0.35 PPL 1132
A
Splice Pack SP201
G
0.35 GRY 1036
L7 C203
0.35 GRY 1036
A6
Instrument Cluster
Class 2
H
J
0.35 YEL 710
K
L
M
0.35 LT GRN 1037
Truck Body Control Module (TBC)
A1
C2
Class 2
A12
C1

DATA LINK CONNECTOR (DLC)

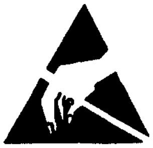
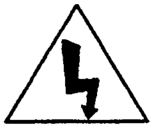


Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)
5
0.35 TAN 800
DLC
B
0.35 TAN 800
HTCM
C2
D7
0.35 TAN 800
D6
0.35 TAN 800
Power Inverter Module
C1
22
0.35 TAN 800
C105
P
0.35 TAN 800
23
0.5 TAN 800
C106
G
0.35 TAN 800
Drive Motor Battery Assembly
Battery Pack Control Module
C300
A
0.35 TAN 800
C103
K
0.35 TAN 800
B
0.35 TAN 800
N
0.35 TAN 800
S114

Data Link Connector Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Drive Motor Unit: 8A-20	8A-20-0

Data Link Connector Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Data Link Connector Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Battery Pack Control Module	Inside drive motor battery pack assembly			
Body Bussed Electrical Center	Behind center of IP			78
Charge Receptacle	Behind front license plate	0	1	50
Data Link Connector (DLC)	Lower LH side of instrument panel	65	66	59
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C2	Under driver's seat	37	38	68
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)	Mounted to cab floor under middle of bench seat	47	48	58
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66

DATA LINK CONNECTOR (DLC)

Name	Location	201-Pg	Fig.	Conn.
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
C103	Chassis harness to propulsion harness, near battery junction block			99
C105	Front body harness to propulsion harness, near P/B booster	12	13	100
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
G105	On top of LH frame rail, near windshield washer bottle			
G204	On power steering pump bracket	63	64	
G206	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
SP201	Behind IP cluster			
SP202	Behind IP cluster			
SP204		63	64	

NOTICE: Perform the On-Board Diagnostic System Check in *SECTION 6* to be certain that no Diagnostic Trouble Codes (DTCs) are stored in EBCM memory which may lead to misdiagnosis.

DIAGNOSIS - DLC PIN ASSIGNMENT

TROUBLESHOOTING HINTS:

1. Check for the proper installation of aftermarket equipment which may affect the integrity of other systems.
2. The diagnostic procedure assumes that all modules are powered. When uncertain as to whether this condition is met, perform the Diagnostic System Check for the module in question.
3. Diagnostic trouble codes (DTCs) may be set due to this symptom and during this diagnostic procedure. Be sure to complete the diagnostic procedure to ensure all DTCs are diagnosed and cleared from memory.

Scan Tool Will Not Communicate with a Class 2 Device

Step	Action	Value(s)	Yes	No
1	Can the scan tool be powered up?	—	Go to Step 9	Go to Step 2
2	1. Disconnect the scan tool from the data link connector. 2. Check for proper connection of the scan tool to the data link at terminals 4 and 16. Is the connection good?	—	Go to Step 3	Go to Step 5
3	Measure voltage from terminal 16 of the DLC to ground. Is voltage approximately 12 volts?	—	Go to Step 4	Go to Step 7
4	Measure resistance from terminal 4 of the DLC to ground. Is the resistance within the specified range?	0-5 Ω	Go to Step 6	Go to Step 8
5	Repair the connection as needed. Is the repair complete?	—	System OK	—
6	Scan tool may be malfunctioning, refer to the scan tool instruction manual. Has a properly operating scan tool been obtained?	—	Go to Step 1	—
7	Repair open in CKT 640. Is the repair complete?	—	System OK	—
8	Repair open in CKT 1850. Is the repair complete?	—	System OK	—
9	1. Turn the ignition switch to RUN. 2. Using the scan tool, attempt to establish communication with each module on the Class 2 data link. (If using a Tech 2, the Class 2 Message Monitor feature can be used to obtain this information.) Are there any modules on the Class 2 data link which are communicating?	—	Go to Step 10	Go to Step 13
10	Are DTCs U1000 and/or U1xxx (Lost Communications With XXX) set in the modules which will communicate?	—	Go to Step 11	Go to Step 12
11	Diagnose the malfunction using the Class 2 Communication Malfunction (U1000) or the Class 2 Lost Communication With XXX (U1xxx) procedures as appropriate. Is the procedure complete?	—	System OK	—
12	Diagnose the malfunction using the Class 2 Lost Communications With XXX (U1xxx) procedures for the module which is not communicating. Is the procedure complete?	—	System OK	—
13	1. Turn the ignition switch to OFF. 2. Check for proper connection of the scan tool to the data link at terminal 5. Is the connection good?	—	Go to Step 14	Go to Step 5
14	Measure resistance from terminal 5 of the DLC to ground. Is the resistance within the specified range?	0-5 Ω	Go to Step 15	Go to Step 30

DATA LINK CONNECTOR (DLC)

Step	Action	Value(s)	Yes	No
15	Check for proper connection of the scan tool to the data link connector at terminal 2. Is the connection good?	—	Go to Step 16	Go to Step 5
16	1. Disconnect splice pack SP201. 2. Check for proper connection of the Class 2 serial data circuit to terminal A of the splice pack. Is the connection good?	—	Go to Step 17	Go to Step 5
17	Measure resistance from terminal 2 of the DLC to terminal A of the splice pack. Is the resistance within the specified range?	0-5 Ω	Go to Step 18	Go to Step 29
18	Measure resistance on the DLC from terminal 2 to terminal 4. Is the resistance as specified?	OL (Infinite)	Go to Step 19	Go to Step 28
19	1. Turn the ignition switch to RUN. 2. Measure voltage on the DLC from terminal 2 to terminal 4. Is the voltage within the specified range?	0-1 volt	Go to Step 20	Go to Step 27
20	1. Turn the ignition switch to OFF. 2. Using the correct terminal adapter from J35616-A, connect a jumper wire to terminal A of the splice pack SP 201. 3. Connect the other end of the jumper wire (with correct terminal adapter) to a terminal in the splice pack SP 201 which is connected to a module. 4. Turn the ignition switch to RUN. 5. Using the scan tool, attempt to establish communication with the module which is jumpered to the DLC. Can communication be established?	—	Go to Step 21	Go to Step 22
21	Repeat step 20 for each module on the Class 2 serial data link. Can communication be established for each module on the Class 2 serial data link?	—	Go to Step 31	Go to Step 22
22	1. Turn the ignition switch to OFF. 2. Disconnect the module which does not communicate. 3. Measure the resistance from the splice pack SP 201 terminal of the Class 2 serial data circuit for the disconnected module to ground. Is the resistance as specified?	OL (Infinite)	Go to Step 23	Go to Step 28
23	1. Turn the ignition switch to RUN. 2. Measure voltage from the Class 2 serial data circuit of the disconnected module to ground. Is the voltage within the specified range?	0-1 volt	Go to Step 24	Go to Step 27

Step	Action	Value(s)	Yes	No
24	1. Turn the ignition switch to OFF. 2. Inspect the connector of the disconnected module in the area of the Class 2 serial data circuit for backed out terminals which would cause a short to ground or voltage. Are all terminals properly locked in to the connector body?	—	Go to Step 25	Go to Step 5
25	1. Replace the module which does not communicate. Refer to the appropriate On-Vehicle Service procedures for the module being replaced to ensure a complete repair. 2. Reconnect the splice pack SP 201. 3. Reconnect all the modules on the Class 2 serial data link. 4. Turn the ignition switch to RUN. 5. Using the scan tool, attempt to establish communication with the module which was replaced. Can communication be established?	—	Go to Step 31	Go to Step 26
26	Replace the Class 2 serial data circuit wire between the splice pack SP 201 and the module which does not communicate. Is the repair complete?	—	Go to Step 31	—
27	1. Turn the ignition switch to OFF. 2. Repair the short to voltage in the Class 2 serial data circuit. Is the repair complete?	—	Go to Step 31	—
28	Repair the short to ground in the Class 2 serial data circuit. Is the repair complete?	—	Go to Step 31	—
29	Repair the open in the Class 2 serial data circuit. Is the repair complete?	—	System OK	—
30	Repair open in CKT 451. Is the repair complete?	—	System OK	—
31	1. Reconnect the splice pack SP 201. 2. Reconnect all the modules on the Class 2 serial data link. 3. Turn the ignition switch to RUN. 4. Wait for 10 seconds. 5. Check for DTCs in each module on the Class 2 serial data link. Are any DTCs which begin with a U set with a current status?	—	Go to Step 33	Go to Step 32
32	Are any DTCs which do not begin with a U set?	—	Go to Step 33	Go to Step 34

DATA LINK CONNECTOR (DLC)

Step	Action	Value(s)	Yes	No
33	Diagnose the DTCs as directed by the diagnostic procedures for the particular module or malfunction. Is the procedure complete?	—	Go to Step 34	—
34	Have all DTCs been diagnosed?	—	Go to Step 35	Go to Step 33
35	Clear all the DTCs. Is the procedure complete?	—	System OK	—

DTC U1000 Class 2 Communication Malfunction

Circuit Description

Modules connected to the Class 2 serial data link monitor the link for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the modules. When a module receives a message for a critical operatin

Conditions for Setting the DTC

- Voltage supplied to the module is in the normal operating voltage range (approximately 9 - 16 volts).
- DTC U1301 is not current.
- At least one critical operating parameter has not been associated with an identification number.
- The above conditions are all met simultaneously for the first five seconds after beginning Class 2 communication.

Action Taken When the DTC Sets

- The module uses a default value for the missing parameter.
- DTC U1000 is set by the module.

Conditions for Clearing the DTC

- A current U1000 will clear when all critical operating parameters for the module have been associated with an identification number or at the end of the current ignition cycle.
- A history U1000 will clear upon receipt of a scan tool Clear DTCs command.

Diagnostic Aids

When a malfunction (such as a blown fuse to a module) occurs while modules are communicating a Lost Communication DTC is set current. When the modules stop communicating (Ignition switch is turned to OFF) the current Lost Communication DTC is cleared but

Test Description

1. This test checks whether the malfunction occurred during an ignition cycle. If it did, then additional information is available to aid in diagnosis.
3. This test determines whether any modules on the Class 2 serial data link are not communicating. If all modules are communicating, the DTC may not be valid.
4. This step verifies that the module which does not communicate is powered and will not communicate via the Class 2 serial data link.
5. This test checks for an improper connection to the module preventing Class 2 serial communication.
6. This test determines whether the malfunction is due to the Class 2 serial data circuit or due to a malfunctioning control module.
7. This test checks for an improper connection to SP201 preventing Class 2 serial communication.
8. This test determines whether the malfunction is due to the Class 2 serial data circuit or due to a malfunction in splice pack SP201.
13. The module which did not communicate due to a Class 2 serial data circuit malfunction may have set Lost Communication DTCs for those modules that it was monitoring.
15. Since the modules which can communicate indicate the module which cannot communicate, it is necessary to clear the DTC from these modules to avoid future misdiagnosis.
18. This test checks for other malfunctions which may have caused DTC U1000 to set.
20. This test determines whether DTC U1000 was set due to a malfunction in the module which set the DTC.

DTC U1000 Class 2 Communication Malfunction

Step	Action	Value(s)	Yes	No
1	Are any history DTCs in the range of U1001 to U1199 also present?	—	Go to Step 2	Go to Step 3
2	Diagnose the malfunction using the Class 2 Lost Communications With XXX (U1xxx) procedure. Is the procedure complete?	—	System OK	—
3	1. Turn the ignition switch to RUN. 2. Using the Tech 2 enter the appropriate model year and vehicle type. 3. Select Diagnostics, select Diagnostic Circuit Check, then select Class 2 Message Monitor. 4. Record all modules which are communicating. 5. Compare the list of modules which are communicating to the schematic showing which modules are connected to terminal 2 (Class 2 serial data link) of the DLC. Are there any modules on the Class 2 serial data link which are not communicating?	—	Go to Step 4	Go to Step 18
4	Perform the Diagnostic System Check for the module which does not communicate to ensure that the module is properly powered. Was a repair made when the Diagnostic System Check was performed?	—	Go to Step13	Go to Step 5
5	1. Turn the Ignition Switch to OFF. 2. Disconnect the module which does not communicate. 3. Check for proper connection of the Class 2 serial data circuit to the module which does not communicate. Is the connection good?	—	Go to Step 6	Go to Step 12
6	1. Measure the resistance of the Class 2 serial data circuit from the connector of the module which does not communicate to the data link connector terminal 2. Is the resistance within the specified range?	0-5 Ω	Go to Step 10	Go to Step 7
7	1. Disconnect splice pack SP201. 2. Check for proper connection of the Class 2 serial data circuit from the module which does not communicate to the splice pack. Is the connection good?	—	Go to Step 8	Go to Step 12
8	1. Measure the resistance of the Class 2 serial data circuit from the connector of the module which does not communicate to the splice pack SP201. Is the resistance within the specified range?	0-5 Ω	Go to Step 9	Go to Step 11
9	Repair/Replace the splice pack SP201. Is the repair complete?	—	Go to Step 13	—
10	Replace the module which does not communicate. Refer to the appropriate On-Vehicle Service procedures for the module being replaced to ensure a complete repair. Is the repair complete?	—	Go to Step 15	—

DATA LINK CONNECTOR (DLC)

Step	Action	Value(s)	Yes	No
11	Repair open in the Class 2 serial data circuit of the module which does not communicate. Is the repair complete?	—	Go to Step 13	—
12	Repair the connection as needed. Is the repair complete?	—	Go to Step 13	—
13	1. Turn the Ignition Switch to RUN. 2. Wait for 10 seconds. 3. Check for DTCs in the module which would not communicate. Are any DTCs which do not begin with a U set?	—	Go to Step 14	Go to Step 15
14	Diagnose the DTCs as directed by the diagnostic procedures for the particular module. Is the procedure complete?	—	Go to Step 15	—
15	Check for DTCs in the module(s) which had U1000 set as a current DTC. Are any DTCs which do not begin with a U set?	—	Go to Step 17	Go to Step 16
16	Clear the DTC(s). Is the procedure complete?	—	System OK	—
17	Diagnose the DTCs as directed by the diagnostic procedures for the particular module. Is the procedure complete?	—	Go to Step 15	—
18	Are any other DTCs present in the module which set U1000?	—	Go to Step 19	Go to Step 20
19	Diagnose the DTCs as directed by the diagnostic procedures for the particular module. Is the procedure complete?	—	Go to Step 20	—
20	1. Turn the Ignition Switch to RUN. 2. Clear the DTCs from the module which set U1000. 3. Turn the Ignition Switch to OFF. 4. Turn the Ignition Switch to RUN. 5. Wait for 10 seconds. 6. Check for DTCs in the module which set U1000. Is DTC U1000 current?	—	Go to Step 21	System OK
21	Replace the module which does not communicate. Refer to the appropriate On-Vehicle Service procedures for the module being replaced to ensure a complete repair. Is repair complete?	—	System OK	—

DTC U1255 Class 2 Communication Malfunction

Circuit Description

Modules connected to the Class 2 serial data link monitor the link for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the modules. In addition to this, Node Alive (State of Health) messag

Conditions for Setting the DTC

- Voltage supplied to the module is in the normal operating voltage range (approximately 9 -16 volts) A Class 2 message that the module expects to receive is not detected on the data link.

Conditions for Clearing the DTC

- A current U1255 will clear when a valid Class 2 message is detected on the Class 2 serial data link or at the end of the current ignition cycle A history U1255 will clear upon receipt of a scan tool Clear DTCs command.

Diagnostic Aids

- Diagnosis of a current U1255 is accomplished via the symptom, Scan Tool will not Communicate with a Class 2 Device.
- An intermittent condition is likely to be caused by a short to ground on the Class 2 serial data link.
- When this DTC is set by the TBCM the symptom observed by the customer is likely to be that the engine doesn't run. When this DTC is set by the TBCM and the engine runs, this indicates that an ignition feed to either the TBCM or the VCM/PCM is open.

DTC U1301 Class 2 Data Link High

Circuit Description

Modules connected to the Class 2 serial data link monitor the link for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the modules. In addition to this, Node Alive (State of Health) messag

Conditions for Setting the DTC

- Voltage supplied to the module is in the normal operating voltage range (approximately 9 - 16 volts) No valid Class 2 messages are detected on the Class 2 serial data link The voltage level detected on the Class 2 serial data link is high The above conditions are all met simultaneously for three seconds.

Action Taken When the DTC Sets

- The module inhibits the setting of all other Class 2 DTCs DTC U1301 is set by the module.

Conditions for Clearing the DTC

- A current U1301 will clear when a valid Class 2 message is detected on the Class 2 serial data link or at the end of the current ignition cycle A history U1301 will clear upon receipt of a scan tool Clear DTCs command.

Diagnostic Aids

This DTC cannot be retrieved with a current status. Diagnosis of a current U1301 is accomplished via the symptom, Scan Tool will not Communicate with a Class 2 Device. An intermittent condition is likely to be caused by a short to voltage on the Class 2 s

DTC U1xxx Class 2 Lost Communication With XXX

The Control Module Identification Number list provides a method for determining which module is not communicating. The diagnostic procedure assumes that all modules are powered. A module with an internal class 2 circuit malfunction or which loses power du

Control Module	Identification Number
Electronic Brake Control Module (EBCM)	41
Transfer Case Control Module (TCCM)	26
Electronic Climate Control Module (ECCM)	None
Instrument Cluster (IPC)	None
Truck Body Control Module (TBCM)	64
Powertrain Control Module (PCM)	16
Vehicle Control Module (VCM)	16

Circuit Description

Modules connected to the Class 2 serial data link monitor the link for serial data communications during normal vehicle operation. Operating information and commands are exchanged among the modules. When a module receives a message for a critical operatin

Conditions for Setting the DTC

- Voltage supplied to the module is in the normal operating voltage range (approximately 9 - 16 volts) DTC 1301 is not current A message from a learned identification number has not been detected for the past five seconds.

Conditions for Clearing the DTC

- A current DTC U1xxx (where xxx is equal to the three digit identification number) will clear when a Node Alive message from the failed identification number is detected on the Class 2 serial data link or at the end of the current ignition cycle A history DTC U1xxx will clear upon receipt of a scan tool Clear DTCs command.

Diagnostic Aids

The ECCM may set Class 2 Lost Communication DTCs when the TBCM or the PCM/VCM is being reprogrammed. After reprogramming, check for DTCs in the ECCM. When only DTCs which begin with a U are set with a history status, clear the DTCs. Otherwise, diagnose th

Test Description

1. This step verifies that the module which does not communicate is powered and will not communicate via the Class 2 serial data link.
2. This test checks for an improper connection to the module preventing Class 2 serial communication.
3. This test determines whether the malfunction is due to the Class 2 serial data circuit or due to a malfunctioning control module.
4. This test checks for an improper connection to SP201 preventing Class 2 serial communication.
5. This test determines whether the malfunction is due to the Class 2 serial data circuit or due to a malfunction in splice pack SP201.
10. The module which did not communicate due to a Class 2 serial data circuit malfunction will have set Lost Communication DTCs for those modules that it was monitoring.
12. Since the modules which can communicate indicate the module which cannot communicate, it is necessary to clear the DTC from these modules to avoid future misdiagnosis.

DTC U1xxx Class 2 Lost Communications With XXX

Step	Action	Value(s)	Yes	No
1	Perform the Diagnostic System Check for the module which does not communicate to ensure that the module is properly powered. Was a repair made when the Diagnostic System Check was performed?	—	Go to Step 10	Go to Step 2
2	1. Turn the Ignition Switch to OFF. 2. Disconnect the module which does not communicate. 3. Check for proper connection of the Class 2 serial data circuit to the module which does not communicate. Is the connection good?	—	Go to Step 3	Go to Step 9
3	1. Measure the resistance of the Class 2 serial data circuit from the connector of the module which does not communicate to the data link connector terminal 2. Is the resistance within the specified range?	0-5 Ω	Go to Step 7	Go to Step 4
4	1. Disconnect splice pack SP201. 2. Check for proper connection of the Class 2 serial data circuit from the module which does not communicate to the splice pack. Is the connection good?	—	Go to Step 5	Go to Step 9
5	Measure the resistance of the Class 2 serial data circuit from the connector of the module which does not communicate to the splice pack SP201. Is the resistance within the specified range?	0-5 Ω	Go to Step 6	Go to Step 8
6	Repair/Replace the splice pack SP201. Is the repair complete?	—	Go to Step 10	—
7	Replace the module which does not communicate. Refer to the appropriate On-Vehicle Service procedures for the module being replaced to ensure a complete repair. Is the repair complete?	—	Go to Step 12	—
8	Repair open in the Class 2 serial data circuit of the module which does not communicate. Is the repair complete?	—	Go to Step 10	—
9	Repair connection as needed. Is the repair complete?	—	Go to Step 10	—
10	1. Turn the Ignition Switch to RUN. 2. Wait for 10 seconds. 3. Check for DTCs in the module which would not communicate. Are any DTCs which do not begin with a U set?	—	Go to Step 14	Go to Step 11
11	Clear the DTCs. Is the procedure complete?	—	Go to Step 12	—

DATA LINK CONNECTOR (DLC)

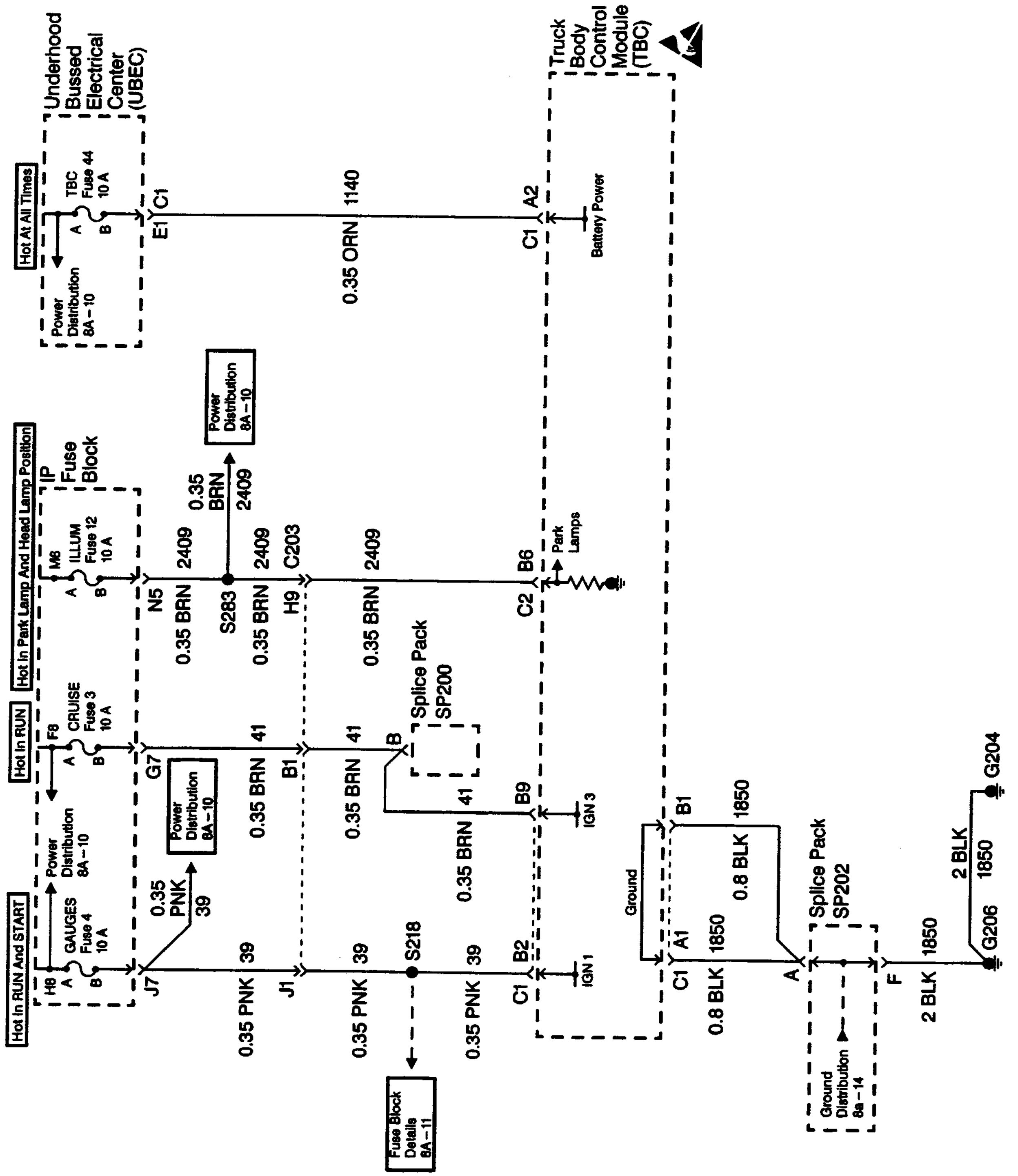
Step	Action	Value(s)	Yes	No
12	Check for DTCs in each module which had the Class 2 Lost Communication DTCs set as a current DTC. Are any DTCs which do not begin with a U set?	—	Go to Step 14	Go to Step 13
13	Clear the DTCs. Is the procedure complete?	—	System OK	—
14	Diagnose the DTCs as directed by the diagnostic procedures for the particular module. Is the procedure complete?	—	Go to Step 11	—

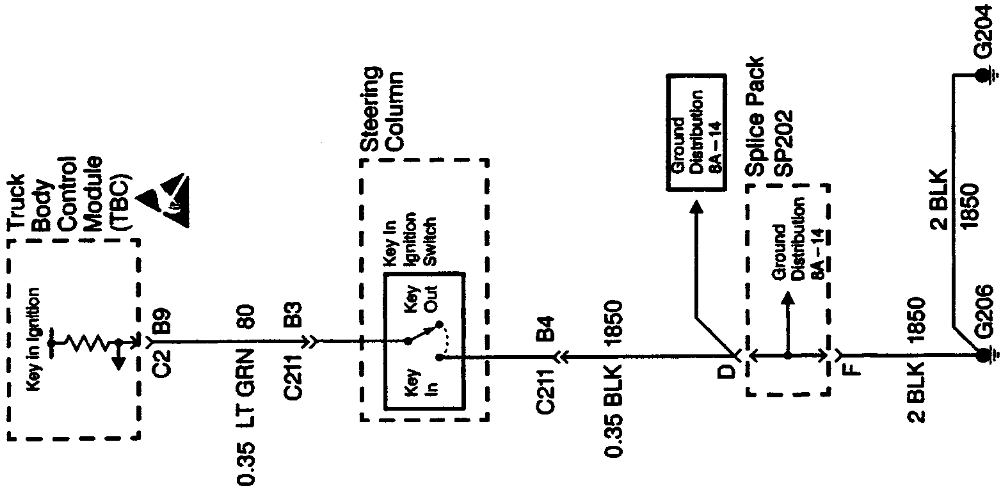
Scan Tool Will Not Communicate with the UART Data Line

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	Go to Step 2	Go to the SIR Diagnostic System Check
2	Can the scan tool be powered up?	—	Go to Step 10	Go to Step 3
3	1. Disconnect the scan tool from the data link connector. 2. Check for proper connection of the scan tool to the data link connector at terminals 4 and 16. Is the connection good?	—	Go to Step 4	Go to Step 6
4	Measure voltage from terminal 16 of the DLC to ground. Is voltage approximately 12 volts?	—	Go to Step 5	Go to Step 8
5	Measure resistance from terminal 4 of the DLC to ground. Is the resistance within the specified range?	0-5 Ω	Go to Step 7	Go to Step 9
6	Repair the connection as needed. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
7	Scan tool may be malfunctioning. Refer to scan tool instruction manual. Has a properly operating scan tool been obtained?	—	Go to Step 2	—
8	Repair open in CKT 640. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
9	Repair open in CKT 1850. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
10	1. Check for proper connection of the scan tool to the data link connector at terminal 9. Is the connection good?	—	Go to Step 11	Go to Step 6

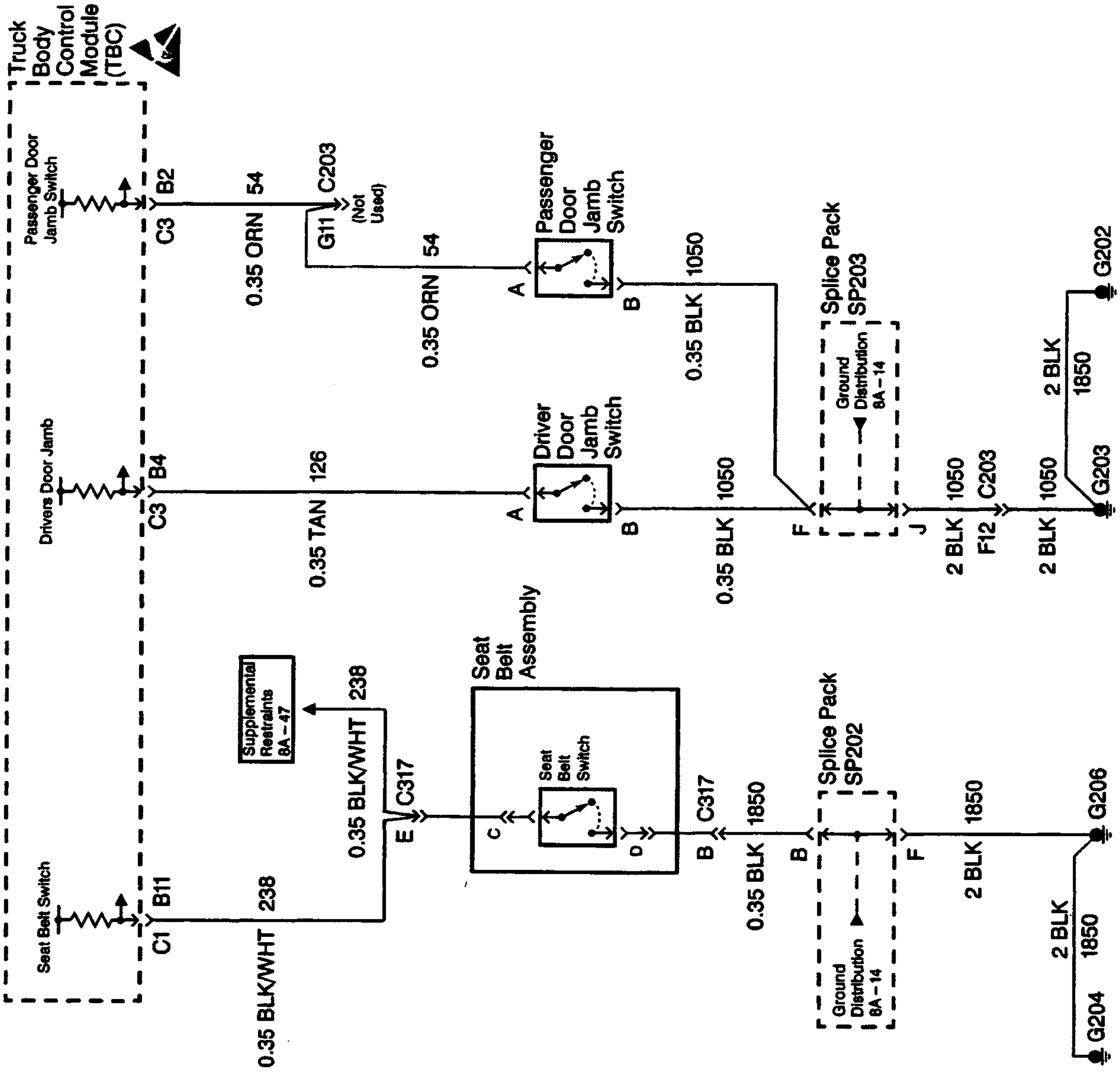
Step	Action	Value(s)	Yes	No
11	1. Disconnect the Inflatable Restraint Sensing and Diagnostic Module. 2. Check for proper connection to the Inflatable Restraint Sensing and Diagnostic Module at terminal 5. Is the connection good?	—	Go to Step 12	Go to Step 19
12	1. Measure resistance from terminal 9 of the DLC to terminal 5 of the Inflatable Restraint Sensing and Diagnostic Module. Is the resistance within the specified range?	0-5 Ω	Go to Step 13	Go to Step 18
13	Measure resistance on the DLC from terminal 9 to terminal 4. Is the resistance as specified?	OL (Infinite)	Go to Step 14	Go to Step 17
14	1. Turn the ignition switch to RUN. 2. Measure voltage on the DLC from terminal 9 to terminal 4. Is the voltage within the specified range?	0-1 volt	Go to Step 15	Go to Step 16
15	1. Turn the ignition switch to OFF. 2. Replace the Inflatable Restraint Sensing and Diagnostic Module. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
16	1. Turn the ignition switch to OFF. 2. Repair the short to voltage in CKT 800. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
17	Repair the short to ground in CKT 800. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
18	Repair the open in CKT 800. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—
19	Repair the connection as needed. Refer to SIR Connector Repair. Is the repair complete?	—	Go to the SIR Diagnostic System Check.	—

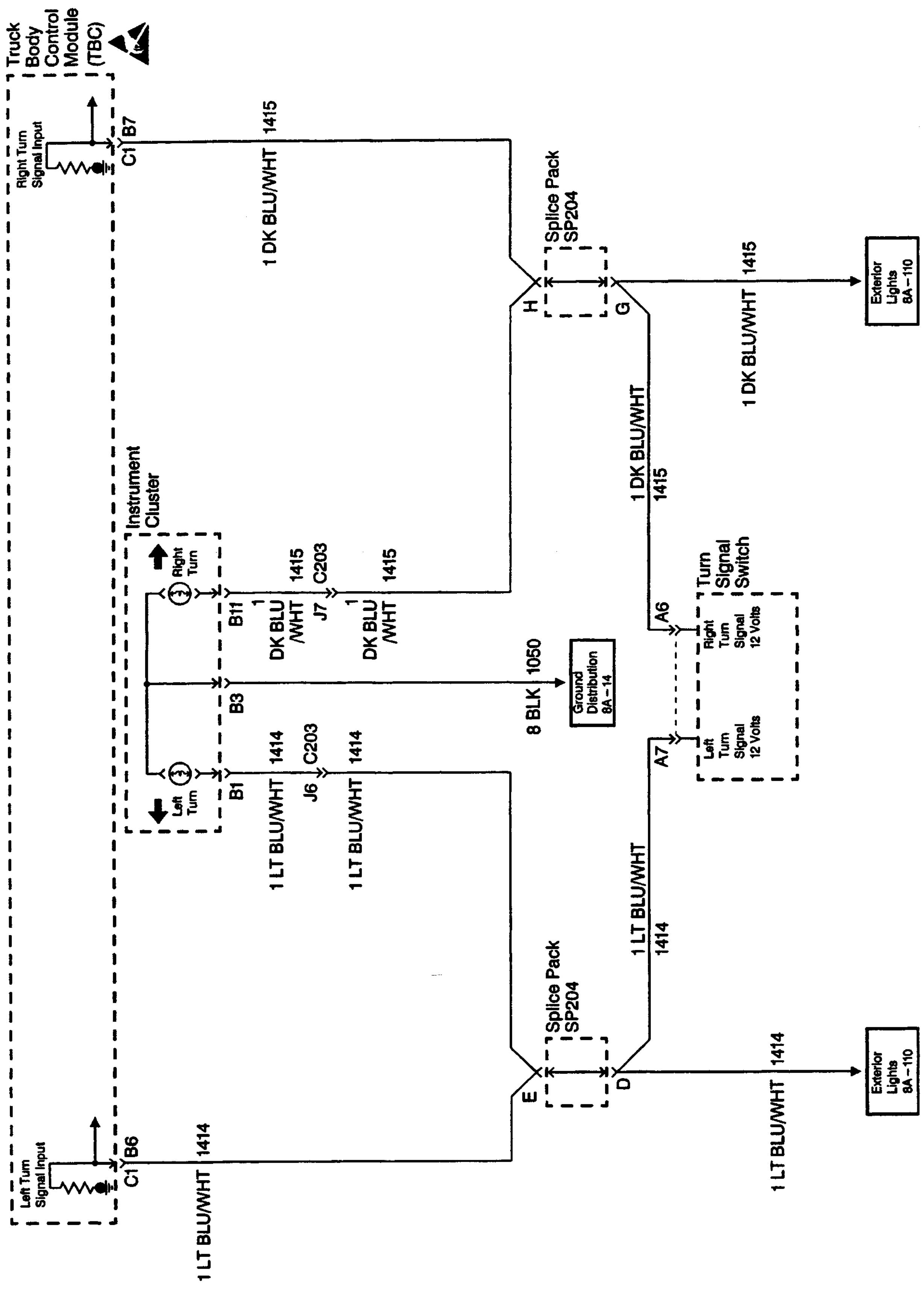
BODY CONTROL MODULE


Hot At All Times
Underhood Bussed Electrical Center (UBEC)
Power Distribution 8A-10
TBC Fuse 44 10 A
A
B
E1
C1
0.35 ORN
1140
C1
A2
Battery Power
Truck Body Control Module (TBC)
Hot In RUN And START
Hot In RUN
Hot In Park Lamp And Head Lamp Position
IP Fuse Block
H8
GAUGES Fuse 4 10 A
Power Distribution 8A-10
F8
CRUISE Fuse 3 10 A
M6
ILLUM Fuse 12 10 A
N5
0.35 BRN
2409
S283
0.35 BRN
2409
Power Distribution 8A-10
0.35 BRN
2409
H9
C203
0.35 BRN
2409
C2
B6
Park Lamps
G7
0.35 BRN
41
B1
0.35 BRN
41
Splice Pack SP200
B
0.35 BRN
41
B9
IGN 3
J7
0.35 PNK
39
0.35 PNK
39
Power Distribution 8A-10
J1
0.35 PNK
39
S218
0.35 PNK
39
C1
B2
IGN 1
Fuse Block Details 8A-11
Ground
C1
A1
B1
0.8 BLK
1850
0.8 BLK
1850
Splice Pack SP202
A
F
Ground Distribution 8a-14
2 BLK
1850
G206
2 BLK
1850
G204

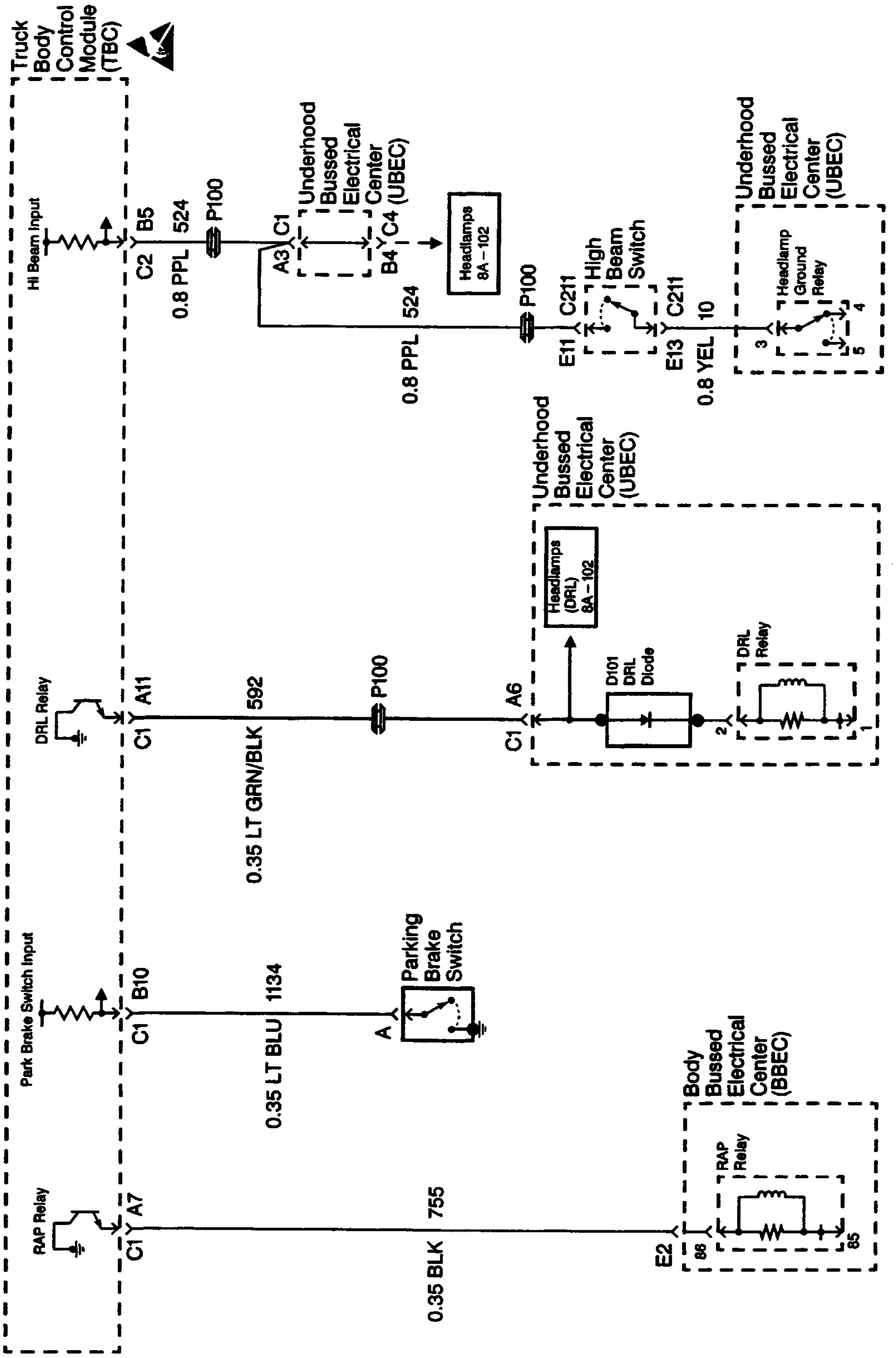

Truck Body Control Module (TBC)
Key in Ignition
C2
B9
0.35 LT GRN
80
C211
B3
Steering Column
Key In Ignition Switch
Key In
Key Out
C211
B4
0.35 BLK
1850
Ground Distribution 8A-14
D
Splice Pack SP202
Ground Distribution 8A-14
F
2 BLK
1850
G206
2 BLK
1850
G204

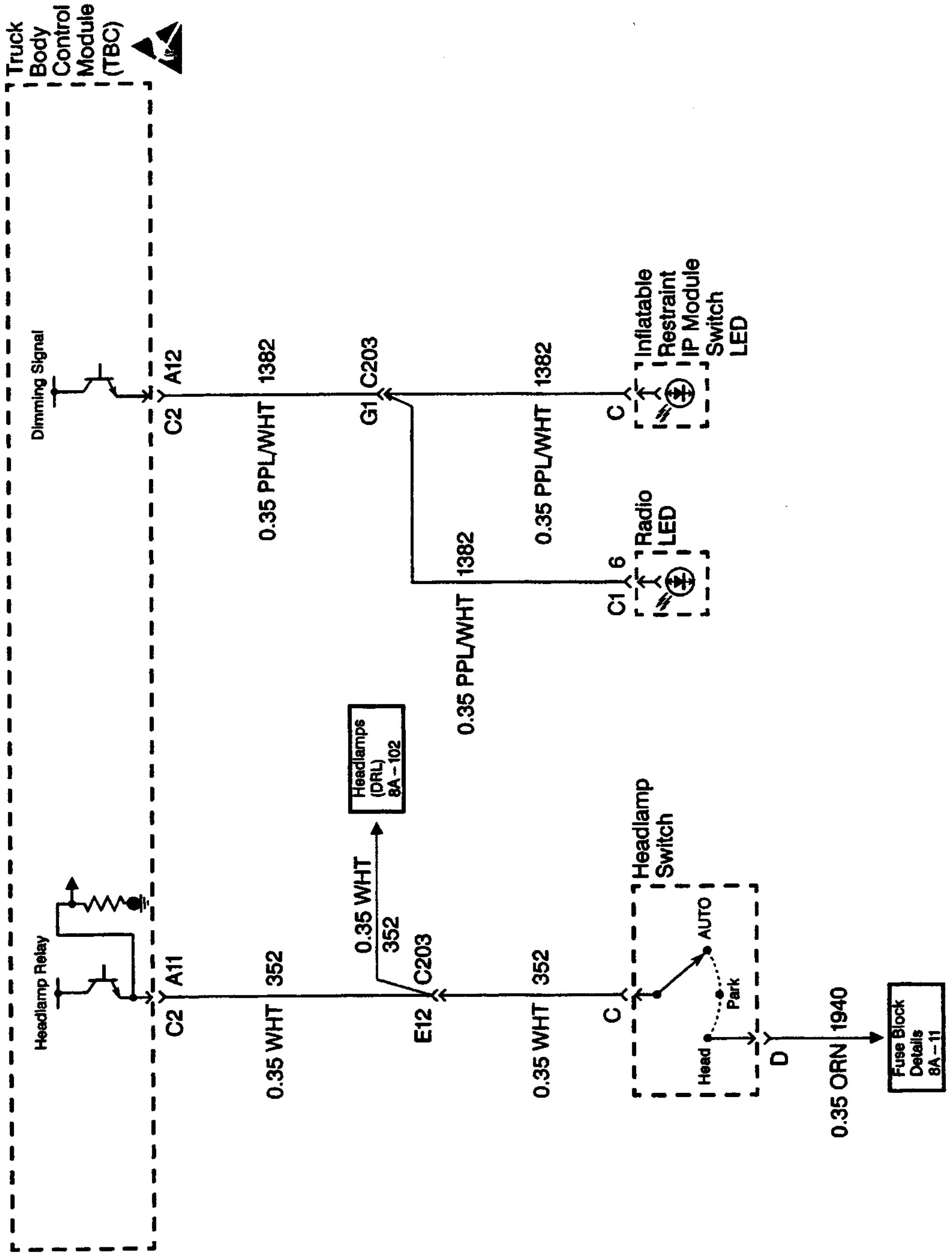
BODY CONTROL MODULE


Truck Body Control Module (TBC)
Passenger Door Jamb Switch
Drivers Door Jamb
Seat Belt Switch
C3
B2
C3
B4
C1
B11
0.35 ORN
54
C203
G11
(Not Used)
0.35 ORN
54
0.35 TAN
126
0.35 BLK/WHT
238
Supplemental Restraints 8A - 47
0.35 BLK/WHT
238
C317
E
Passenger Door Jamb Switch
A
B
Driver Door Jamb Switch
A
B
Seat Belt Assembly
Seat Belt Switch
C
D
B
C317
0.35 BLK
1050
0.35 BLK
1050
0.35 BLK
1850
Splice Pack SP203
Ground Distribution 8A - 14
F
J
Splice Pack SP202
Ground Distribution 8A - 14
B
F
2 BLK
1050
F12
C203
2 BLK
1050
2 BLK
1850
G202
G203
2 BLK
1850
G206
2 BLK
1850
G204

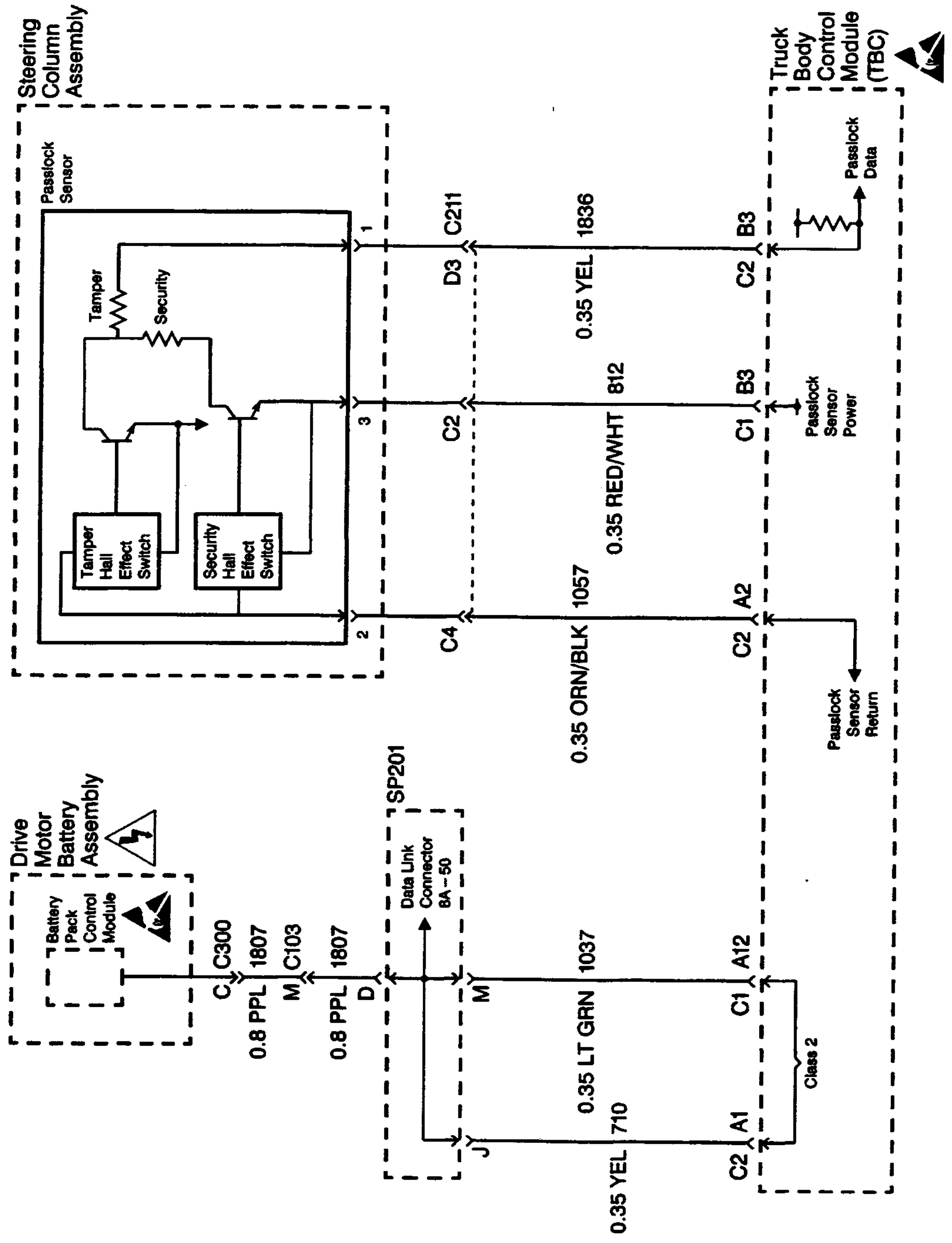

Truck Body Control Module (TBC)
Right Turn Signal Input
C1 B7
1 DK BLU/WHT 1415
Splice Pack SP204
H
G
1 DK BLU/WHT 1415
Exterior Lights 8A-110
Instrument Cluster
Right Turn
Left Turn
B11
1 DK BLU /WHT 1415
C203
J7
1 DK BLU /WHT 1415
B3
8 BLK 1050
Ground Distribution 8A-14
B1
1 LT BLU/WHT 1414
C203
J6
1 LT BLU/WHT 1414
1 DK BLU/WHT 1415
Turn Signal Switch
A6
Right Turn Signal 12 Volts
A7
Left Turn Signal 12 Volts
1 LT BLU/WHT 1414
Splice Pack SP204
E
D
1 LT BLU/WHT 1414
Exterior Lights 8A-110
Left Turn Signal Input
C1 B6
1 LT BLU/WHT 1414

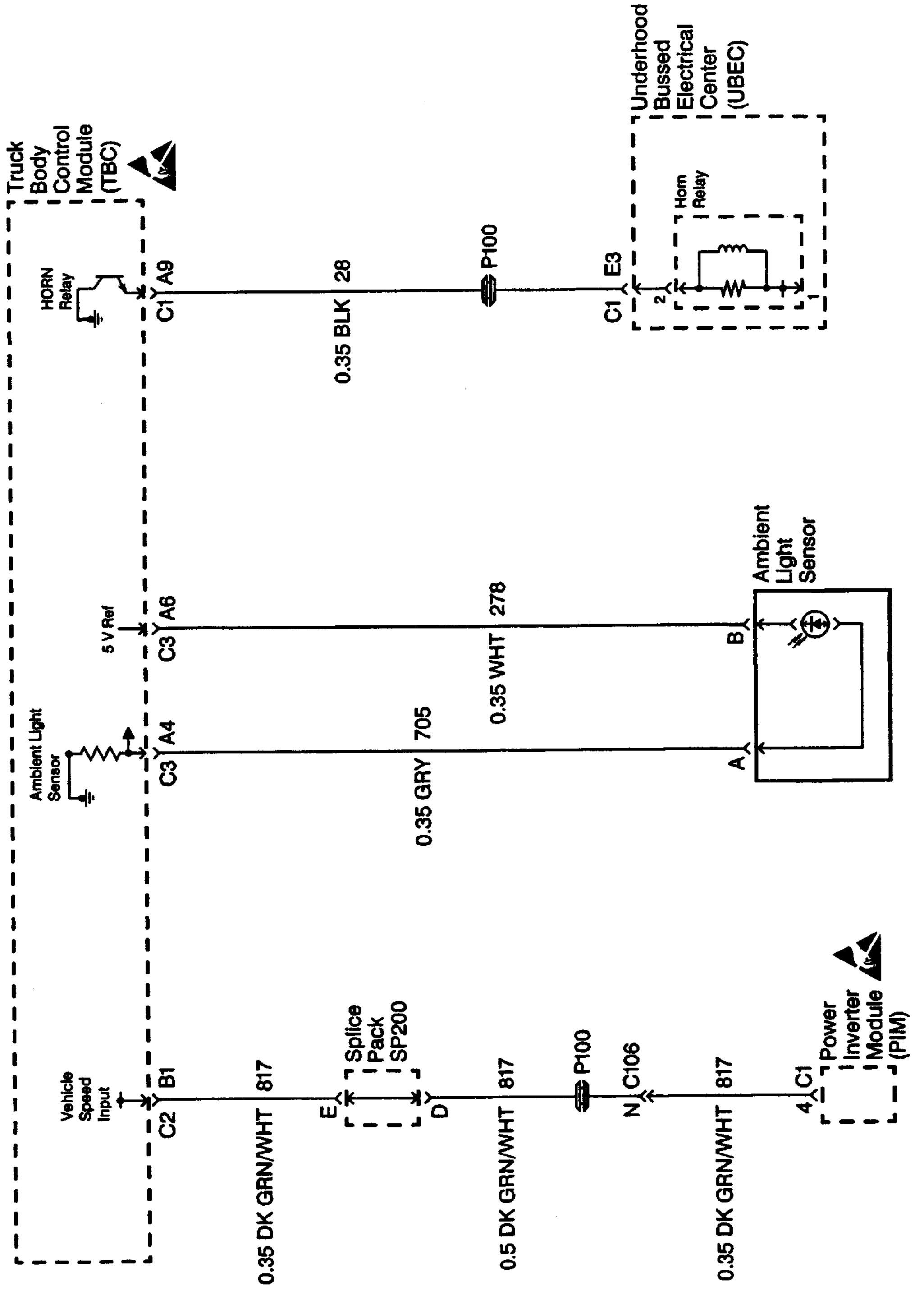
BODY CONTROL MODULE


Truck Body Control Module (TBC)
Hi Beam Input
C2 B5
0.8 PPL 524
P100
A3 C1
Underhood Bussed Electrical Center (UBEC)
B4 C4
Headlamps 8A - 102
0.8 PPL 524
P100
E11 C211
High Beam Switch
E13 C211
0.8 YEL 10
3
Headlamp Ground Relay
5 4
Underhood Bussed Electrical Center (UBEC)
DRL Relay
C1 A11
0.35 LT GRN/BLK 592
P100
C1 A6
Underhood Bussed Electrical Center (UBEC)
Headlamps (DRL) 8A - 102
D101 DRL Diode
DRL Relay
2 1
Park Brake Switch Input
C1 B10
0.35 LT BLU 1134
A
Parking Brake Switch
RAP Relay
C1 A7
0.35 BLK 755
E2
86 85
Body Bussed Electrical Center (BBEC)
RAP Relay

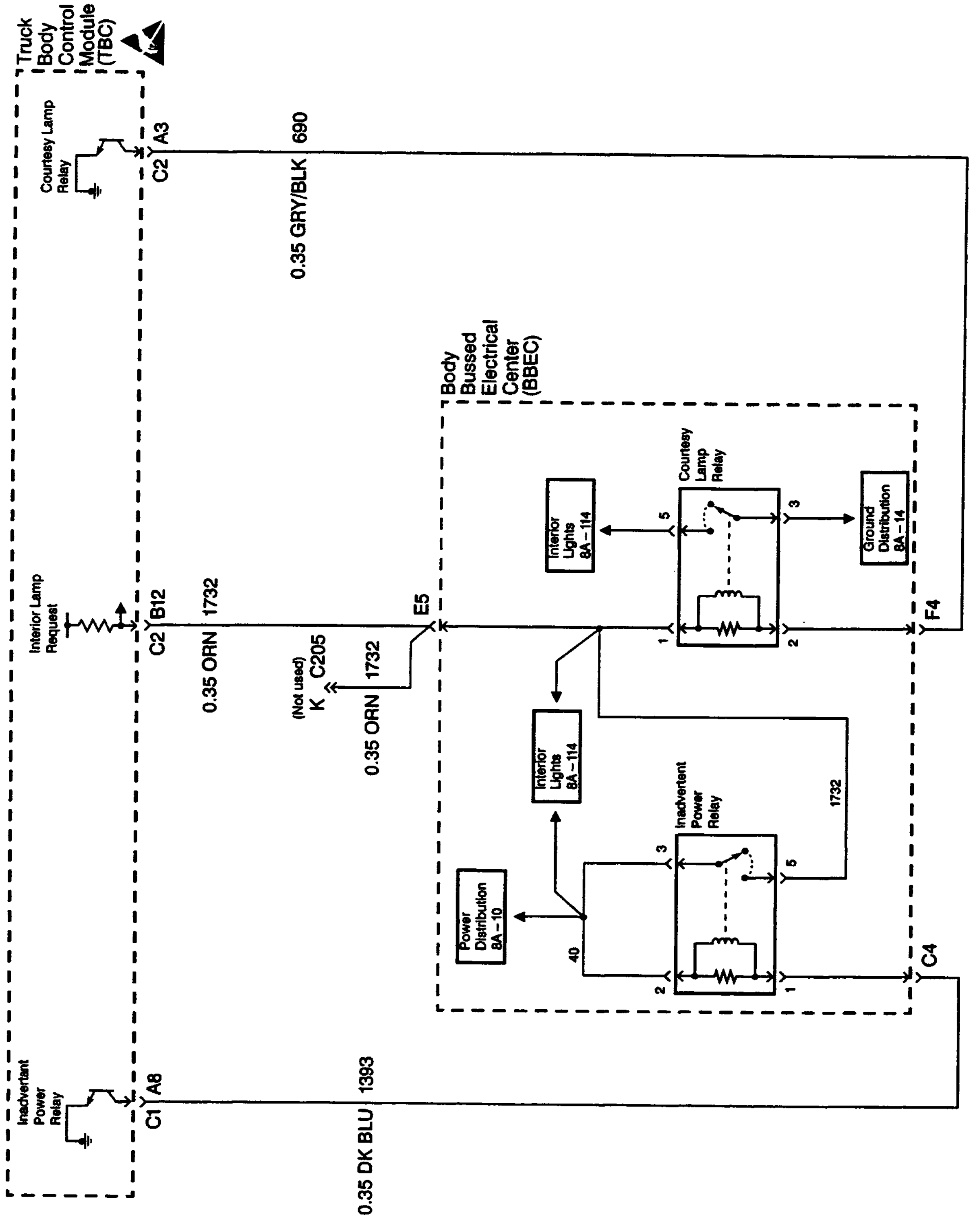

Truck Body Control Module (TBC)
Dimming Signal
Headlamp Relay
C2
A12
1382
0.35 PPL/WHT
G1
C203
1382
0.35 PPL/WHT
C
Inflatable Restraint IP Module Switch LED
1382
0.35 PPL/WHT
C1
6
Radio LED
C2
A11
352
0.35 WHT
E12
C203
0.35 WHT
352
Headlamps (DRL) 8A-102
352
0.35 WHT
C
Headlamp Switch
AUTO
Park
Head
D
1940
0.35 ORN
Fuse Block Details 8A-11

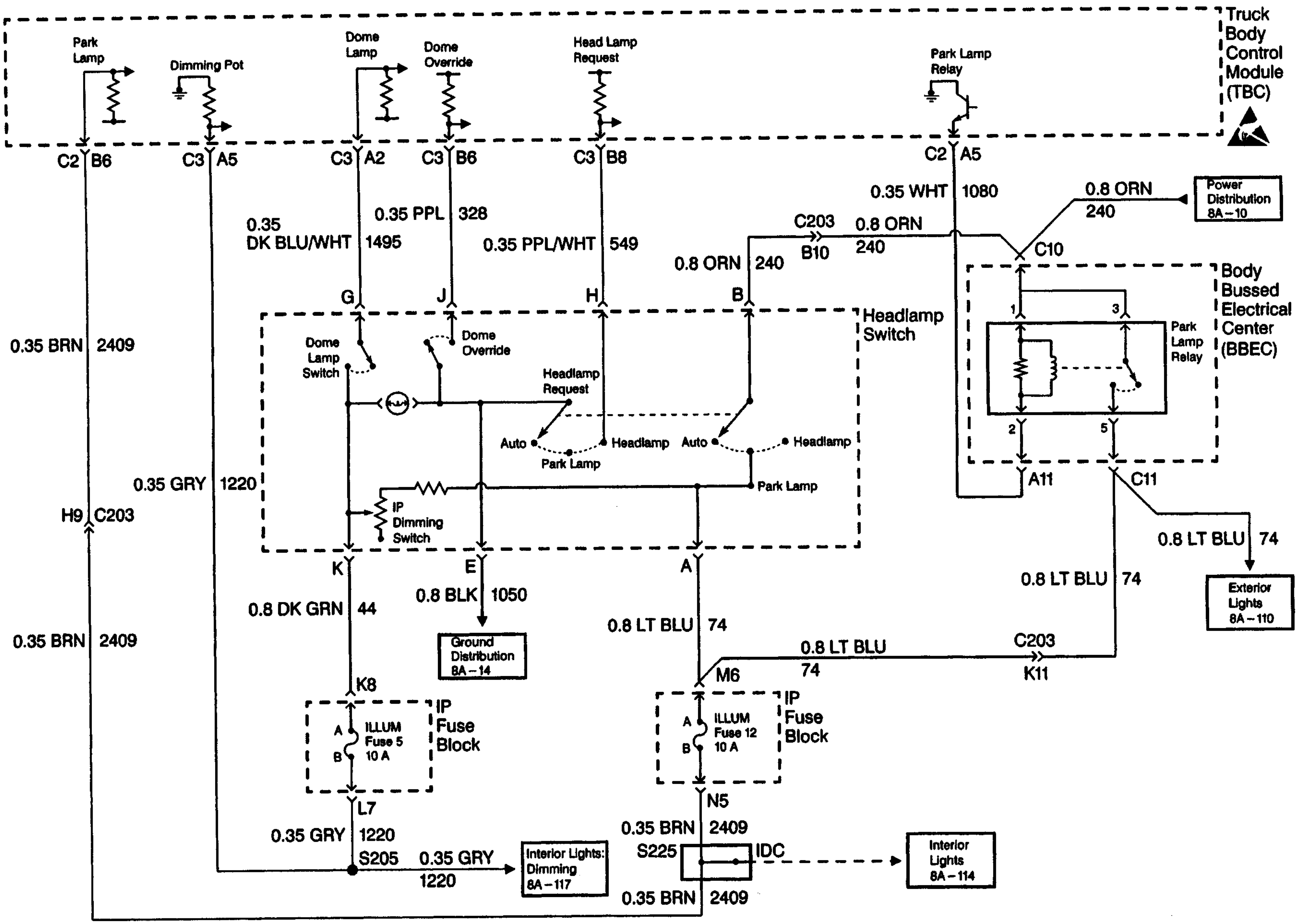
BODY CONTROL MODULE


Steering Column Assembly
Passlock Sensor
Tamper
Security
Tamper Hall Effect Switch
Security Hall Effect Switch
1
3
2
D3
C211
C2
C4
0.35 YEL
1836
0.35 RED/WHT
812
0.35 ORN/BLK
1057
C2
B3
C1
B3
C2
A2
Truck Body Control Module (TBC)
Passlock Data
Passlock Sensor Power
Passlock Sensor Return
Drive Motor Battery Assembly
Battery Pack Control Module
C
C300
0.8 PPL
1807
M
C103
0.8 PPL
1807
D
SP201
Data Link Connector 8A-50
M
J
0.35 LT GRN
1037
0.35 YEL
710
C1
A12
C2
A1
Class 2


Truck Body Control Module (TBC)
HORN Relay
C1
A9
0.35 BLK
28
P100
C1
E3
2
1
Horn Relay
Underhood Bussed Electrical Center (UBEC)
5 V Ref
C3
A6
0.35 WHT
278
B
Ambient Light Sensor
Ambient Light Sensor
C3
A4
0.35 GRY
705
A
Vehicle Speed Input
C2
B1
0.35 DK GRN/WHT
817
E
Splice Pack SP200
D
0.5 DK GRN/WHT
817
P100
N
C106
0.35 DK GRN/WHT
817
4
C1
Power Inverter Module (PIM)

BODY CONTROL MODULE

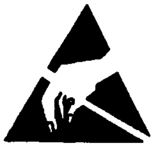
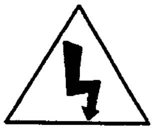

Truck Body Control Module (TBC)
Courtesy Lamp Relay
C2
A3
690
0.35 GRY/BLK
Interior Lamp Request
C2
B12
1732
0.35 ORN
E5
(Not used)
K
C205
1732
0.35 ORN
Body Bussed Electrical Center (BBEC)
Interior Lights 8A-114
Courtesy Lamp Relay
5
3
Ground Distribution 8A-14
1
2
F4
Interior Lights 8A-114
Inadvertent Power Relay
3
5
1732
Power Distribution 8A-10
40
2
1
C4
Inadvertent Power Relay
C1
A8
1393
0.35 DK BLU


Truck Body Control Module (TBC)
Park Lamp
Dimming Pot
Dome Lamp
Dome Override
Head Lamp Request
Park Lamp Relay
C2 B6
C3 A5
C3 A2
C3 B6
C3 B8
C2 A5
0.35 WHT 1080
0.8 ORN 240
Power Distribution 8A-10
0.35 DK BLU/WHT 1495
0.35 PPL 328
0.35 PPL/WHT 549
C203 B10
0.8 ORN 240
0.8 ORN 240
C10
Body Bussed Electrical Center (BBEC)
1
3
Park Lamp Relay
2
5
A11
C11
G
J
H
B
Headlamp Switch
Dome Lamp Switch
Dome Override
Headlamp Request
Auto
Headlamp
Park Lamp
Auto
Headlamp
Park Lamp
IP Dimming Switch
0.35 BRN 2409
0.35 GRY 1220
H9 C203
0.35 BRN 2409
K
E
A
0.8 DK GRN 44
0.8 BLK 1050
Ground Distribution 8A-14
0.8 LT BLU 74
0.8 LT BLU 74
0.8 LT BLU 74
Exterior Lights 8A-110
0.8 LT BLU 74
C203 K11
M6
K8
IP Fuse Block
A ILLUM Fuse 5 10 A B
IP Fuse Block
A ILLUM Fuse 12 10 A B
N5
L7
0.35 GRY 1220
S205
0.35 GRY 1220
Interior Lights: Dimming 8A-117
0.35 BRN 2409
S225
IDC
0.35 BRN 2409
Interior Lights 8A-114

Body Control Module Schematic Reference Table

Reference on Schematic	Location
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Headlamps: Daytime Running Lamps: 8A-102	8A-102-0
Interior Lights: 8A-114	8A-114-0
Interior Lights Dimming: 8A-117	8A-117-0

Body Control Module Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Body Control Module Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Ambient Light Sensor	Mounted under RH IP speaker grill			0
Battery Pack Control Module	Inside drive motor battery pack assembly			
Body Bussed Electrical Center	Behind center of IP			78
Courtesy Lamp Relay	In the body bussed electrical center (BBEC)			
Daytime Running Lamps (DRL) Relay	In underhood bussed electrical center (UBEC)	45	46	39
Door Jamb Switch, LH	In LH side of IP			26
Door Jamb Switch, RH	In RH side of IP	38	39	27
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Headlamp Switch	Left of steering wheel, in IP	34	35	54
High-Beam Switch	Part of multifunction switch	3	4	
Horn Relay	In underhood bused electrical center	45	46	35
Inadvertent Power Relay	In the body bussed electrical center (BBEC)			
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
IP Module Switch	Center of dash, right of steering wheel			44
Key In Ignition Switch	In steering column, part of ignition switch			

Name	Location	201-Pg	Fig.	Conn.
Park Brake Indicator Switch	On parking brake bracket, near top of pedal arm	40	41	
Park Lamp Relay	In body bussed electrical center (BBEC)			
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Radio C1	Center of IP behind Radio	56	57	56
Retained Accessory Power Relay	In the body bussed electrical center (BBEC)			
Safety Belt Switch	Front body harness to seat belt switch, near base of LH seatbelt receiver	36	37	46
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Truck Body Control Module (TBC)—C3	Part of multifunction switch on steering column	55	56	60
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
C103	Chassis harness to propulsion harness, near battery junction block			99
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C207	Front body harness to seat belt switch extension, under driver's seat			97
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
D101	Front body harness 17.5 cm left of blower motor relay break out			
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
G204	On power steering pump bracket	63	64	
G206	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S218	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S283				

BODY CONTROL MODULE

Name	Location	201-Pg	Fig.	Conn.
SP200	Behind IP cluster			
SP201	Behind IP cluster			
SP202	Behind IP cluster			
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			
SP204		63	64	

NOTICE: Refer to *Section 8D* for Body Control Module (TBC) diagnostics.

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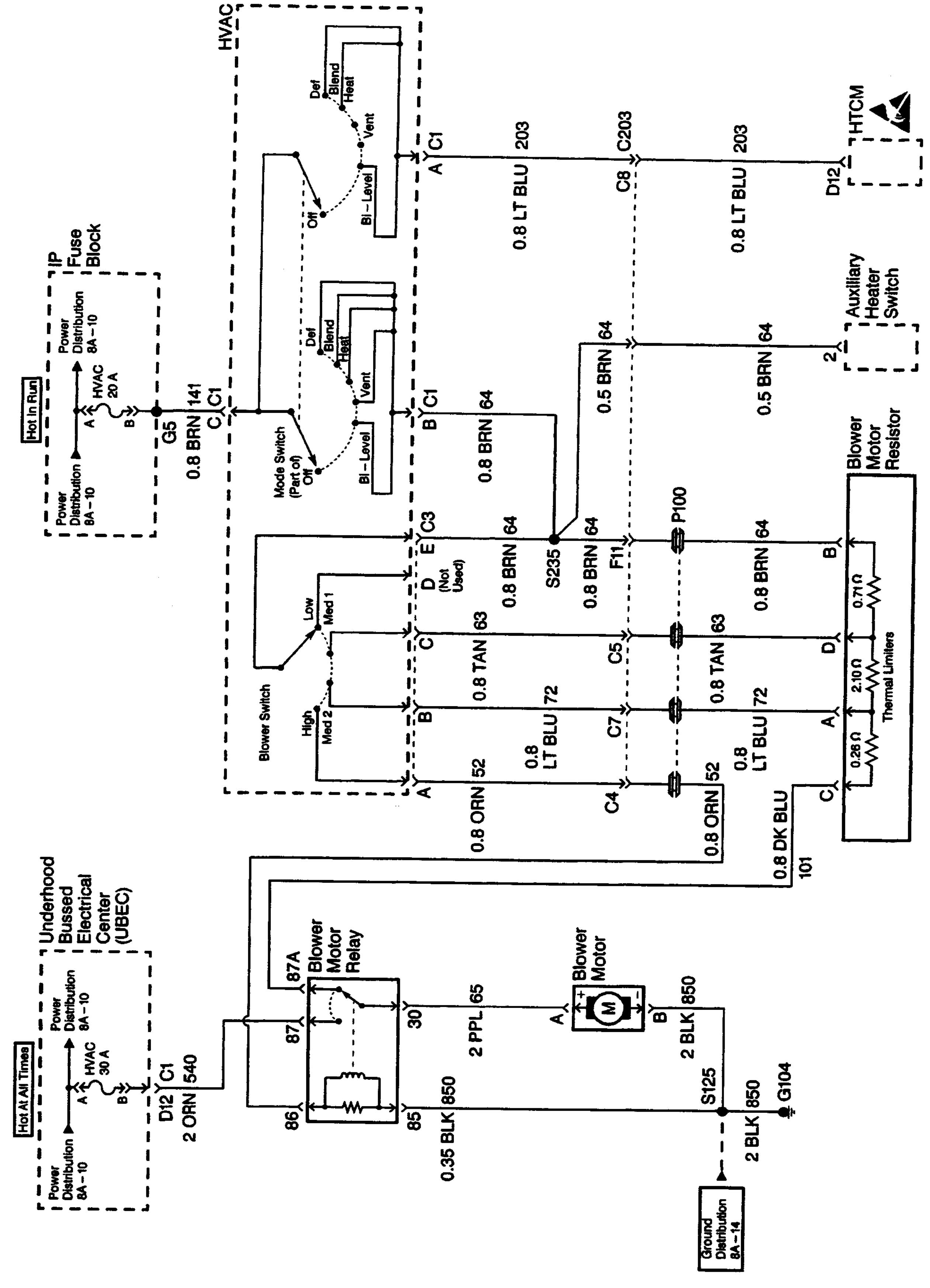
HVAC - BLOWER CONTROLS: MANUAL


Hot In Run
IP Fuse Block
Power Distribution 8A-10
HVAC 20 A
A
B
G5
0.8 BRN 141
C C1
HVAC
Mode Switch (Part of)
Off
Bi-Level
Vent
Heat
Blend
Def
A C1
0.8 LT BLU 203
C203
C8
D12
HTCM
B C1
0.8 BRN 64
0.5 BRN 64
Auxiliary Heater Switch
2
Blower Switch
Low
Med 1
Med 2
High
E C3
D (Not Used)
C
B
A
S235
F11
P100
0.8 TAN 63
0.8 LT BLU 72
0.8 ORN 52
C5
C7
C4
Blower Motor Resistor
Thermal Limiters
0.71 Ω
2.10 Ω
0.26 Ω
0.8 DK BLU 101
Hot At All Times
Underhood Bussed Electrical Center (UBEC)
HVAC 30 A
D12 C1
2 ORN 540
Blower Motor Relay
87A
87
86
30
85
2 PPL 65
Blower Motor
M
+
-
2 BLK 850
0.35 BLK 850
S125
G104
Ground Distribution 8A-14

HVAC - Blower Controls Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Exterior Lights: 8A-110	8A-110-0

HVAC - Blower Controls Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Blower Motor	RH side of engine compartment	25	26	2
Blower Motor Relay	RH rear of engine compartment	24	25	38
Blower Motor Resistor	RH rear of engine compartment in evaporator housing	26	27	33
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM) - C2	Under driver's seat	37	38	68
HVAC Control C1	Part of HVAC controls in center of IP	49	50	27
HVAC Control C3	Part of HVAC controls in center of IP	49	50	41
IP Fuse Block	LH side of instrument panel	33	34	76
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
G104	On top of RH frame rail, near auxiliary battery	5	6	
P100	Below brake master cylinder at bulkhead	25	26	
S125	Front body harness 20cm right of brake vacuum booster at top of bulkhead			
S235	In I/P harness 4cm from run channel in HVAC control harness breakout	41	42	

HVAC - Blower Controls Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Turn mode selector switch to DEF position. Cycle Blower switch from LOW to HIGH. Repeat for BLEND, HEAT, VENT, BI-LEVEL, NORM, and MAX A/C positions.	Blower motor runs in all positions	• *Blower motor does not operate in any position* • *Blower motor does not operate in low* • *Blower motor does not operate in medium 1* • *Blower motor does not operate in medium 2* • *Blower motor does not operate in high* • *Blower motor only runs in high* • *Blower motor runs continuously in high*
2	Turn blower switch to high. Turn mode selector to DEF, BLEND, HEAT, VENT, BI-LEVEL, NORM, and MAX A/C.	Blower motor runs in all positions.	• *Blower motor does not run in one or more positions of the mode selector switch.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

HVAC - BLOWER CONTROLS: MANUAL

Blower Motor Does Not Operate In Any Position

Step	Action	Value(s)	Yes	No
1	1. Disconnect blower motor resistor. 2. Connect a test lamp between CKT 64 (BRN) wire and ground. 3. Turn ignition switch to RUN. 4. Cycle mode selector between MAX and DEF. Did the test lamp light in all positions of the mode switch?	—	Go to *Step 4*	Go to *Step 2*
2	Did the test lamp light in some of the positions of the mode switch?	—	Go to *Step 3*	Go to *Step 15*
3	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—
4	Connect a fused jumper between CKT 64 (BRN) wire and CKT 101 (DK BLU) wire in blower motor resistor connector Did the blower motor operate?	—	Go to *Step 5*	Go to *Step 6*
5	Replace blower motor resistor. Did you complete the blower motor resistor replacement?	—	System OK	—
6	1. Reconnect blower motor resistor. 2. Disconnect blower motor relay. 3. Connect a test lamp between CKT 101 (DK BLU) wire and ground. Did the test lamp light?	—	Go to *Step 8*	Go to *Step 7*
7	Locate and repair open CKT 101 (DK BLU) wire. Did you complete the wire repair?	—	System OK	—
8	Connect a fused jumper between CKT 101 (DK BLU) wire and CKT 65 (PPL) wire. Does the blower motor operate?	—	Go to *Step 9*	Go to *Step 10*
9	Replace blower motor relay. Did you complete the blower motor relay replacement?	—	System OK	—
10	1. Disconnect blower motor. 2. Connect a test lamp between CKT 65 (PPL) wire at blower motor and ground. Did the test lamp light?	—	Go to *Step 12*	Go to *Step 11*
11	Locate and repair open in CKT 65 (PPL) wire. Did you complete the wire repair?	—	System OK	—
12	Connect a self-powered test lamp between CKT 850 (BLK) wire and ground. Did the test lamp light?	—	Go to *Step 14*	Go to *Step 13*
13	Locate and repair open CKT 850 (BLK) wire. Did you complete the wire repair?	—	System OK	—
14	Replace blower motor. Did you complete the blower motor replacement?	—	System OK	—

Step	Action	Value(s)	Yes	No
15	Inspect fuse 9. Is fuse 9 open?	—	Go to *Step 21*	Go to *Step 16*
16	Connect a test lamp between CKT 141 (BRN) wire cavity C of HVAC Control connector C1 and ground. Did the test lamp light?	—	Go to *Step 18*	Go to *Step 17*
17	Locate and repair open in CKT 141 (BRN) wire. Did you complete the wire repair?	—	System OK	—
18	1. Connect a test lamp between CKT 64 (BRN) wire cavity B of HVAC Control connector C1 and ground. 2. Observe test lamp and move mode selector switch from OFF to DEF. Did the test lamp light in all positions of the mode switch?	—	Go to *Step 20*	Go to *Step 19*
19	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—
20	Locate and repair open in CKT 64 (BRN) wire. Did you complete the wire repair?	—	System OK	—
21	1. Disconnect HVAC Control connectors. 2. Connect a self-powered test lamp between CKT 141 (BRN) cavity C of HVAC Control connector C2 and ground. Did the test lamp light?	—	Go to *Step 22*	Go to *Step 23*
22	Locate and repair short to ground in CKT 141 (BRN) wire. Did you complete the wire repair?	—	System OK	—
23	Connect a self-powered test lamp between CKT 64 (BRN) wire cavity B of HVAC Control connector C1 and ground. Did the test lamp light?	—	Go to *Step 24*	Go to *Step 25*
24	Locate and repair short to ground in CKT 64 (BRN) wire. Did you complete the wire repair?	—	System OK	—
25	Connect a self-powered test lamp between CKT 63 (TAN) wire cavity C of HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 26*	Go to *Step 27*
26	Locate and repair short to ground in CKT 63 (TAN) wire. Did you complete the wire repair?	—	System OK	—
27	Connect a self-powered test lamp between CKT 72 (LT BLU) wire cavity B of HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 28*	Go to *Step 29*
28	Locate and repair short to ground in CKT 72 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—

HVAC - BLOWER CONTROLS: MANUAL

Step	Action	Value(s)	Yes	No
29	1. Remove blower motor relay 2. Connect a self-powered test lamp between CKT 52 (ORN) wire cavity A of HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 30*	Go to *Step 31*
30	Locate and repair short to ground in CKT 52 (ORN) wire. Did you complete the wire repair?	—	System OK	—
31	1. Reconnect HVAC Control. 2. Connect a self-powered test lamp to CKT 64 (BRN) wire at blower motor resistor. Did the test lamp light?	—	Go to *Step 33*	Go to *Step 33*
32	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—
33	Connect a digital ohmeter between terminal 86 and 85 of blower motor relay Is the resistance less than the specified value?	0.5 Ω	Go to *Step 34*	Go to *Step 35*
34	Replace blower motor relay. Did you complete the blower motor relay replacement?	—	System OK	—
35	Locate and repair intermittent short in CKT 141 (BRN) wire, CKT 64 (BRN) wire, CKT 63 (TAN) wire, CKT 72 (LT BLU) wire, or CKT 52 (ORN) wire. Did you complete the wire repair?	—	System OK	—

Blower Motor Does Not Operate In Low

Step	Action	Value(s)	Yes	No
1	1. Disconnect Blower Motor Resistor. 2. Connect a test lamp between CKT 64 (BRN) wire and ground. 3. Turn ignition switch to RUN and mode selector switch to HEAT Did the test lamp light?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open in CKT 64 (BRN) wire between blower motor resistor and S235 Did you complete the wire repair?	—	System OK	—
3	Replace blower motor resistor. Did you complete the blower motor replacement?	—	System OK	—

Blower Motor Does Not Operate In Medium1

Step	Action	Value(s)	Yes	No
1	1. Disconnect Blower Motor Resistor. 2. Connect a test lamp between CKT 63 (TAN) wire and ground. 3. Turn ignition switch to RUN and mode selector switch to HEAT. 4. Turn blower switch to medium1. Did the test lamp light?	—	Go to *Step 2*	Go to *Step 3*
2	Replace blower motor resistor. Did you complete the blower motor resistor replacement?	—	System OK	—
3	Connect a test lamp between CKT 63 (TAN) wire cavity C at HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 4*	Go to *Step 5*
4	Locate and repair open CKT 63 (TAN) wire. Did you complete the wire repair?	—	System OK	—
5	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—

Blower Motor Does Not Operate In Medium2

Step	Action	Value(s)	Yes	No
1	1. Disconnect Blower Motor Resistor. 2. Connect a test lamp between CKT 72 (LT BLU) wire and ground. 3. Turn ignition switch to RUN and mode selector switch to HEAT. 4. Turn blower switch to medium2. Did the test lamp light?	—	Go to *Step 2*	Go to *Step 3*
2	Replace blower motor resistor. Did you complete the blower motor resistor replacement?	—	System OK	—
3	Connect a test lamp between CKT 72 (LT BLU) wire cavity B at HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 4*	Go to *Step 5*
4	Locate and repair open CKT 72 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—
5	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—

Blower Motor Does Not Operate In High

Step	Action	Value(s)	Yes	No
1	1. Disconnect Blower Motor Relay. 2. Connect a test lamp between CKT 52 (ORN) wire and ground. 3. Turn ignition switch to RUN and mode selector switch to HEAT. 4. Turn blower switch to high. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 2*
2	Connect a test lamp between CKT 52 (ORN) wire cavity A at HVAC Control connector C3 and ground. Did the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Locate and repair open CKT 52 (ORN) wire. Did you complete the wire repair?	—	System OK	—
4	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—
5	Connect a self-powered test lamp between CKT 850 (BLK) wire at blower motor relay and ground. Did the test lamp light?	—	Go to *Step 7*	Go to *Step 6*
6	Locate and repair open CKT 850 (BLK) wire between blower motor relay and S125. Did you complete the wire repair?	—	System OK	—
7	Connect a test lamp between CKT 540 (ORN) wire and ground. Did the test lamp light?	—	Go to *Step 8*	Go to *Step 9*
8	Replace blower motor relay. Did you complete the blower motor replacement?	—	System OK	—
9	Inspect HVAC fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 11*	Go to *Step 10*
10	Locate and repair open CKT 540 (ORN) wire. Did you complete the wire repair?	—	System OK	—
11	Connect a self-powered test lamp between CKT 540 (ORN) wire at blower motor relay and ground. Did the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	1. Locate and repair short to ground in CKT 540 (ORN) wire. 2. Replace fusible link. Did you complete the wire repair?	—	System OK	—
13	1. Locate and repair intermittent short to ground in CKT 540 (ORN) wire. 2. Replace fusible link. Did you complete the wire repair?	—	System OK	—

Blower Motor Only Runs In High

Step	Action	Value(s)	Yes	No
1	1. Disconnect Blower Motor Relay. 2. Connect a test light between DK BLU (101) wire and ground. 3. Turn ignition to RUN and mode selector to HEAT. 4. Cycle Blower motor switch from low to medium1 to medium2. Did the test lamp light in any position?	—	Go to *Step 2*	Go to *Step 3*
2	Replace blower motor relay. Did you complete the blower motor relay replacement?	—	System OK	—
3	Replace blower motor resistor. Did you complete the blower motor resistor replacement?	—	System OK	—

Blower Motor Runs Continuously In High

Step	Action	Value(s)	Yes	No
1	Disconnect Blower Motor Relay. Did the blower motor stop running?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair short to voltage in CKT 65 (PPL) wire. Did you complete the wire repair?	—	System OK	—
3	Connect a test lamp between CKT 52 (ORN) wire and ground. Does the test lamp light?	—	Go to *Step 4*	Go to *Step 5*
4	Locate and repair short to voltage in CKT 52 (ORN) wire. Did you complete the wire repair?	—	System OK	—
5	Replace blower motor relay. Did you complete the blower motor relay replacement?	—	System OK	—

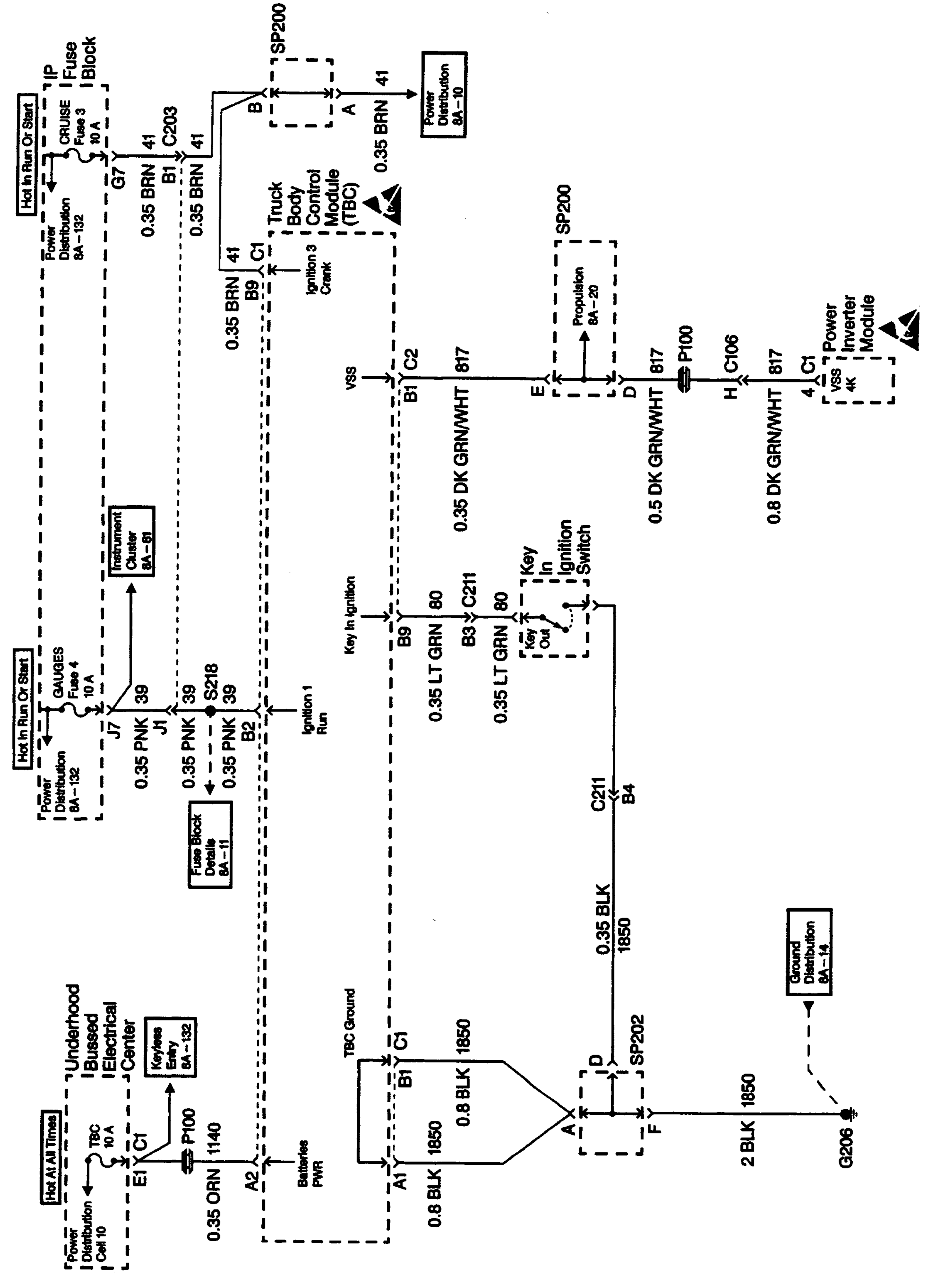
Blower Motor Does Not Run In All Positions Of The Mode Selector Switch

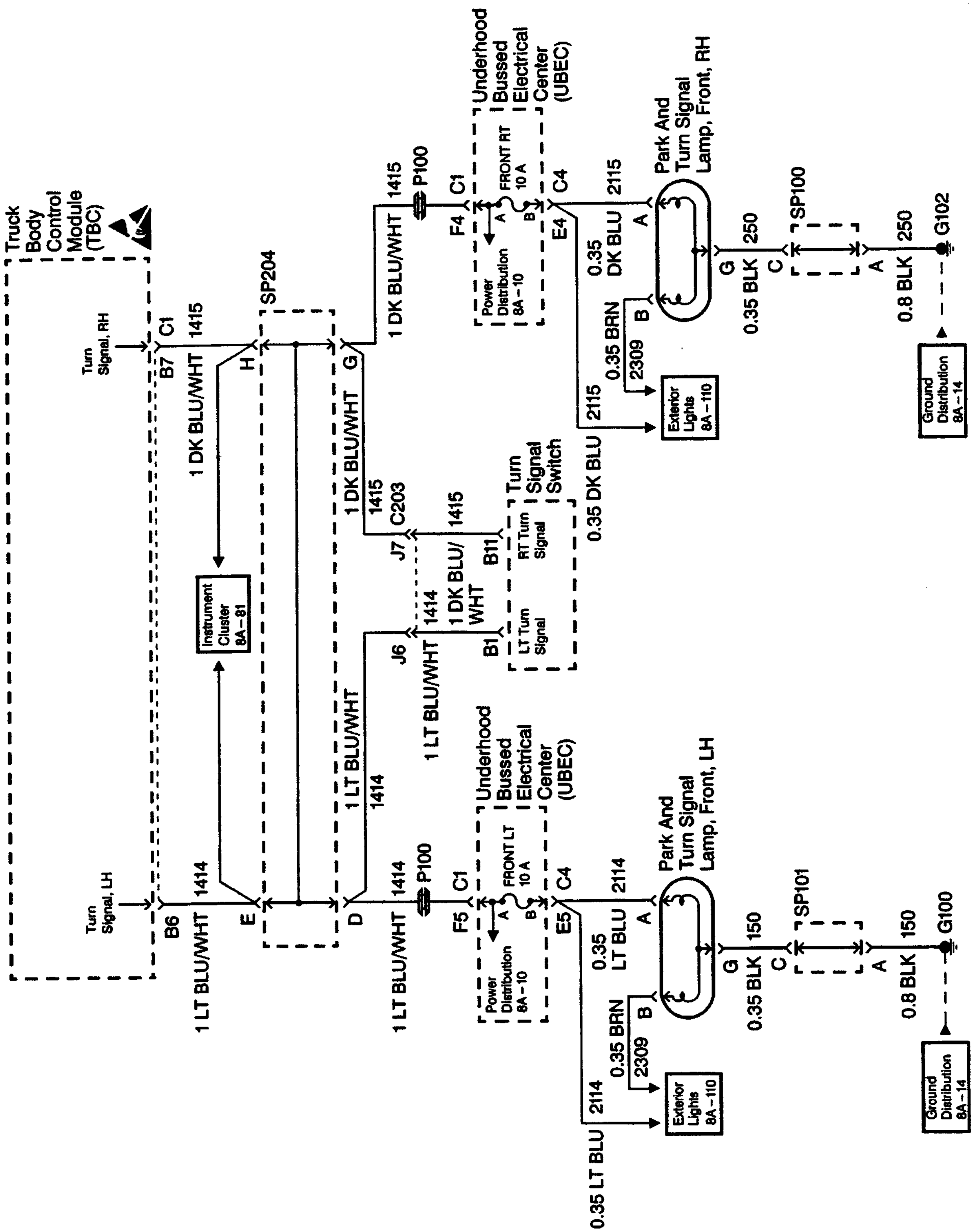
Step	Action	Value(s)	Yes	No
1	Replace HVAC Control. Did you complete the HVAC Control replacement?	—	System OK	—

CIRCUIT OPERATION

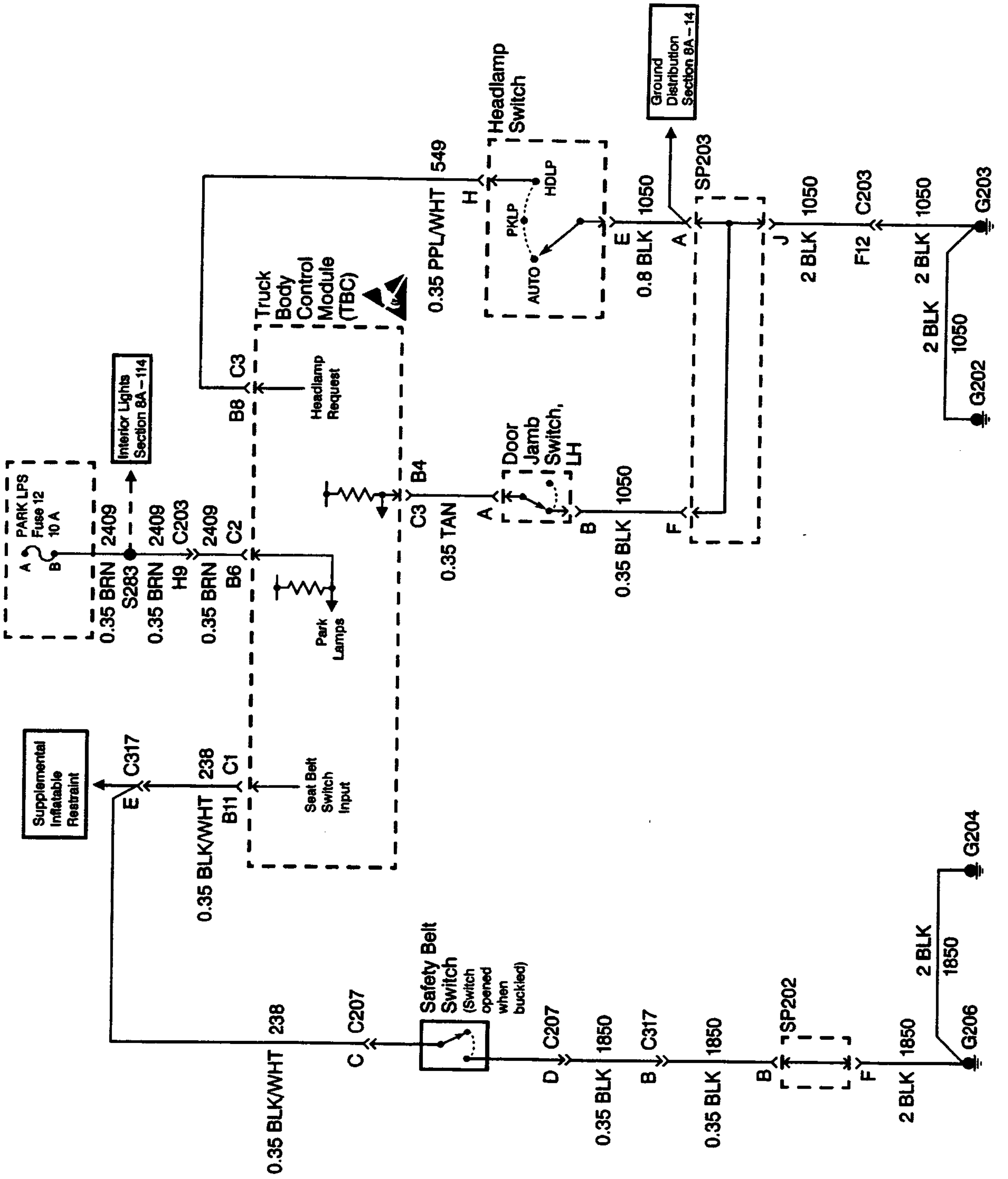
Voltage is supplied to the HVAC Control by fuse 9. Power to the blower motor is supplied through the Mode selector switch in the DEF, BLEND, HEAT, VENT, BI-LEVEL, NORM, and MAX A/C positions. Splice S235 splits the power source between the blower motor resistor and the blower switch. As long as the Mode selector switch is in one of the powered positions, power will always be present at cavity B of the blower motor resistor. In the low position, voltage passes through all three resistors in the blower motor resistor, through the blower motor relay and to the blower motor. In medium1, voltage passes through two resistors, and in medium2, voltage goes through one resistor. The high position supplies trigger voltage to the blower motor relay. This energizes the blower motor relay and supplies full battery voltage to the blower motor through the HVAC fuse in the underhood bussed electrical center (UBEC) Ground is provided at G117.

AUDIBLE WARNINGS


Hot In Run Or Start
Power Distribution 8A-132
CRUISE Fuse 3 10 A
IP Fuse Block
G7
0.35 BRN
41
B1 C203
0.35 BRN
41
SP200
B
A
0.35 BRN
41
Power Distribution 8A-10
Truck Body Control Module (TBC)
0.35 BRN
41
B9 C1
Ignition 3 Crank
VSS
B1 C2
0.35 DK GRN/WHT
817
SP200
Propulsion 8A-20
E
D
0.5 DK GRN/WHT
817
P100
H C106
0.8 DK GRN/WHT
817
4 C1
VSS 4K
Power Inverter Module
Instrument Cluster 8A-81
Hot In Run Or Start
Power Distribution 8A-132
GAUGES Fuse 4 10 A
J7
0.35 PNK
39
J1
0.35 PNK
39
S218
0.35 PNK
39
B2
Ignition 1 Run
Fuse Block Details 8A-11
Key In Ignition
B9
0.35 LT GRN
80
B3 C211
0.35 LT GRN
80
Key In Ignition Switch
Key Out
C211
B4
0.35 BLK
1850
Ground Distribution 8A-14
Hot At All Times
Power Distribution Cell 10
TBC 10 A
E1 C1
Underhood Bussed Electrical Center
Keyless Entry 8A-132
P100
0.35 ORN
1140
A2
Batteries PWR
TBC Ground
B1 C1
0.8 BLK
1850
A1
0.8 BLK
1850
D
SP202
A
F
2 BLK
1850
G206


Truck Body Control Module (TBC)
Turn Signal, RH
Turn Signal, LH
B7
C1
B6
1415
1414
1 DK BLU/WHT
1 LT BLU/WHT
SP204
H
E
G
D
Instrument Cluster 8A-81
1 DK BLU/WHT
1415
P100
C1
F4
F5
Power Distribution 8A-10
FRONT RT 10 A
FRONT LT 10 A
A
B
Underhood Bussed Electrical Center (UBEC)
C4
E4
E5
2115
2114
0.35 DK BLU
0.35 LT BLU
Park And Turn Signal Lamp, Front, RH
Park And Turn Signal Lamp, Front, LH
G
250
150
0.35 BLK
C
SP100
SP101
0.8 BLK
G102
G100
0.35 BRN
2309
Exterior Lights 8A-110
Ground Distribution 8A-14
C203
J7
J6
B11
B1
1414
1 DK BLU/WHT
1 LT BLU/WHT
RT Turn Signal
LT Turn Signal
Turn Signal Switch
0.35 DK BLU
0.35 LT BLU

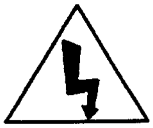
AUDIBLE WARNINGS


PARK LPS
Fuse 12
10 A
A
B
0.35 BRN
2409
S283
0.35 BRN
2409
C203
H9
0.35 BRN
2409
B6
C2
Interior Lights
Section 8A-114
Park
Lamps
Truck
Body
Control
Module
(TBC)
Headlamp
Request
B8
C3
0.35 PPL/WHT
549
H
Headlamp
Switch
PKLP
HDLP
AUTO
E
0.8 BLK
1050
A
SP203
Ground
Distribution
Section 8A-14
J
2 BLK
1050
F12
C203
2 BLK
1050
G203
2 BLK
1050
G202
B4
C3
0.35 TAN
A
Door
Jamb
Switch,
LH
B
0.35 BLK
1050
F
Seat Belt
Switch
Input
B11
C1
0.35 BLK/WHT
238
E
C317
Supplemental
Inflatable
Restraint
0.35 BLK/WHT
238
C
C207
Safety Belt
Switch
(Switch
opened
when
buckled)
D
C207
0.35 BLK
1850
B
C317
0.35 BLK
1850
B
SP202
F
2 BLK
1850
G206
2 BLK
1850
G204

Audible Warnings Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Drive Motor Unit: 8A-20	8A-20-0
Instrument Cluster: 8A-81	8A-81-0
Exterior Lights: 8A-110	8A-110-0
Interior Lights: 8A-114	8A-114
Remote Keyless Entry: 8A-132	8A-132-0

Audible Warnings Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Audible Warnings Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Headlamp Switch	Left of steering wheel, in IP	34	35	54
IP Fuse Block	LH side of instrument panel	33	34	76
Key In Ignition Switch	In steering column, part of ignition switch			
Park/Turn Signal Lamp, LH Front	Left front corner of front bumper	4	5	28
Park/Turn Signal Lamp, RH Front	Right front corner of front bumper	4	5	29
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Safety Belt Switch	Front body harness to seat belt switch, near base of LH seatbelt receiver	36	37	46
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Truck Body Control Module (TBC)—C3	Part of multifunction switch on steering column	55	56	60
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80

AUDIBLE WARNINGS

Name	Location	201-Pg	Fig.	Conn.
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C207	Front body harness to seat belt switch extension, under driver's seat			97
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
G100	Left front of vehicle mounted to radiator core support by LH headlamp	4	5	
G102	On right front of vehicle, mounted to radiator core support, by RH headlamp	4	5	
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
G204	On power steering pump bracket	63	64	
G206	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S218	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
SP100	Left front of vehicle mounted to radiator support			
SP101	Right front of vehicle mounted to radiator support	62	63	
SP200	Behind IP cluster			
SP202	Behind IP cluster			
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			
SP204		63	64	

Audible Warnings Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Get in vehicle and close the door. Turn Ignition to the RUN position.	Fasten seat belt indicator lights and the Audio alarm sounds. Light and alarm quit after approximately 10 seconds.	• *Fasten belts lamp does not light and alarm does not sound with seat belt unbuckled.* • *Fasten belts lamp does not light but alarm does sound with seat belt unbuckled.* • *Fasten belts lamp lights but alarm does not sound with seat belt unbuckled.*
2	Turn ignition off and fasten seat belt. Turn ignition to the RUN position.	Fasten seat belt indicator does not light and the audio alarm does not sound.	• *Fasten belts lamp lights and/or alarm sounds with seat belt buckled.*

Step	Action	Normal Results	Abnormal Result*
3	Turn ignition off, leave keys in the ignition and open the driver's door.	Audible warning sounds as long as the driver's door is open.	• *Key in ignition alarm does not sound with key in ignition and driver's door open.*
4	Close driver's door, remove key from ignition. Turn headlamps to HEAD or PARK position. Make sure the interior lights dimming switch is not at maximum dimming. Open driver's door.	Audible warning sounds as long as the headlamps are on and the door is open.	• *Lamps on warning alarm does not sound with ignition off and lamps on.*
5	Drive vehicle and turn on either turn signal for at least.75 miles.	Audible warning sounds with the flashing of the turn signal.	• *Turn signal reminder does not sound.*
6	Perform Steps 1-5	Audio alarm sounds properly in each situation.	• *Audio alarm does not operate at all.* • *Audio alarm sounds continuously.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

Audio Alarm Does Not Operate At All

Step	Action	Value(s)	Yes	No
1	Using a scan tool, attempt to communicate with the truck body control module (TBC). Are you able to communicate with the truck body control module (TBC)?	—	Go to *Step 2*	Refer to *Section 8D* for TBC diagnosis
2	Using a scan tool, check truck body control module (TBC) for codes. Are there any truck body control module (TBC) codes present?	—	Refer to *Section 8D* for TBC diagnosis	Go to *Step 3*
3	Replace truck body control module (TBC). Did you complete the TBC replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

AUDIBLE WARNINGS

Audio Alarm Sounds Continuously

Step	Action	Value(s)	Yes	No
1	Using a scan tool, attempt to communicate with the truck body control module (TBC). Are you able to communicate with the truck body control module (TBC)?	—	Go to *Step 2*	Refer to *Section 8D* for TBC diagnosis
2	Using a scan tool, check truck body control module (TBC) for codes. Are there any truck body control module (TBC) codes present?	—	Refer to *Section 8D* for TBC diagnosis	Go to *Step 3*
3	Replace truck body control module (TBC). Did you complete the TBC replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

Fasten Belts Lamp Does Not Light and Alarm Does Not Sound With Seat Belt Unbuckled

Step	Action	Value(s)	Yes	No
1	1. Disconnect truck body control module (TBC). 2. Connect a self-powered test lamp between CKT 238 (BLK/WHT) wire. 3. Make sure driver's seat belt is not buckled. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 2*
2	1. Disconnect seat belt switch. 2. Connect a self powered test lamp between CKT 1850 (BLK) wire and ground. Did the test lamp light?	—	Go to *Step 4*	Go to *Step 3*
3	Locate and repair open CKT 1850 (BLK) wire. Did you complete the wire repair?	—	System OK	—
4	1. Connect a fused jumper between CKT 238 (BLK/WHT) wire and CKT 1850 (BLK) wire at seat belt switch. 2. Connect a self-powered test lamp between CKT 238 (BLK/WHT) wire at truck body control module (TBC) connector. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 6*
5	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

Fasten Belts Lamp Does Not Light But Alarm Sounds With Seat Belt Unbuckled

Step	Action	Value(s)	Yes	No
1	Using a scan tool, check truck body control module (TBC) for communication codes (U-codes). Are there any U-codes present?	—	Refer to *Section 8A-50* for Class 2 wiring diagnosis	Go to *Step 2*
2	Using scan tool, initiate instrument cluster segment test. Does the fasten seat belts lamp illuminate?	—	Go to *Step 3*	Refer to *Section 8C1* for instrument cluster diagnosis.
3	Replace truck body control module (TBC). Did you complete the TBC replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

Fasten Belts Lamp Lights But Alarm Does Not Sound With Seat Belt Unbuckled

Step	Action	Value(s)	Yes	No
1	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

Fasten Belts Lamp Lights And/Or Alarm Sounds With Seat Belt Buckled

Step	Action	Value(s)	Yes	No
1	1. Disconnect truck body control module (TBC). 2. Connect a self-powered test lamp between CKT 238 (BLK/WHT) wire. 3. Make sure the driver's seat belt is fastened. Did the test lamp light?	—	Go to *Step 2*	Go to *Step 5*
2	1. Disconnect seat belt switch. 2. Connect a self powered test lamp between CKT 238 (BLK/WHT) wire and ground. Did the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Locate and repair short to ground in CKT 238 (BLK/WHT) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
4	Replace seat belt switch. Did you complete the seat belt switch replacement?	—	System OK	—
5	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—

Key In Ignition Alarm Does Not Sound With Key In Ignition And Driver's Door Open

Step	Action	Value(s)	Yes	No
1	Using a scan tool, attempt to communicate with the truck body control module (TBC). Are you able to communicate with the truck body control module (TBC)?	—	Go to *Step 2*	Refer to *Section 8D* for TBC diagnosis
2	Using a scan tool, check truck body control module (TBC) for codes. Are there any truck body control module (TBC) codes present?	—	Refer to *Section 8D* for TBC diagnosis	Go to *Step 3*
3	1. Disconnect truck body control module (TBC). 2. Connect a self-powered test lamp between CKT 80 (LT GRN) wire and ground. 3. Insert key in ignition. Did the test lamp light?	—	Go to *Step 4*	Go to *Step 11*
4	1. Connect a self-powered test lamp between CKT 126 (TAN) wire cavity B4 connector C3 at TBC and ground. 2. Open the driver's door. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 6*
5	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—
6	1. Disconnect driver's door jamb switch. 2. Connect a fused jumper between terminals A and B of door jamb switch connector. 3. Connect a self-powered test lamp between CKT 126 (TAN) wire cavity B4 connector C3 at TBC and ground. Did the test lamp light?	—	Go to *Step 7*	Go to *Step 8*
7	Replace door jamb switch. Did you complete the door jamb switch replacement?	—	System OK	—

Step	Action	Value(s)	Yes	No
8	1. Connect a fused jumper between CKT 126 (TAN) wire cavity A at door jamb switch and ground. 2. Connect a self-powered test lamp between CKT 126 (TAN) wire cavity B4 connector C3 at TBC and ground. Did the test lamp light?	—	Go to *Step 9*	Go to *Step 10*
9	Locate and repair open CKT 1050 (BLK) wire. Did you complete the wire repair?	—	System OK	—
10	Locate and repair open CKT 126 (TAN) wire. Did you complete the wire repair?	—	System OK	—
11	1. Disconnect C211. 2. Connect a fused jumper between CKT 80 (LT GRN) wire cavity B3 and CKT 1850 (BLK) wire cavity B4. 3. Connect a self-powered test lamp between CKT 80 (LT GRN) wire and ground at TBC. Did the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	Replace key in ignition switch. Did you complete the key in ignition switch replacement?	—	System OK	—
13	1. Connect a fused jumper between CKT 80 (LT GRN) wire cavity B3 and ground. 2. Connect a self-powered test lamp between CKT 80 (LT GRN) wire and ground at TBC. Did the test lamp light?	—	Go to *Step 14*	Go to *Step 15*
14	Locate and repair open CKT 1850 (BLK) wire. Did you complete the wire repair?	—	System OK	—
15	Locate and repair open CKT 80 (LT GRN) wire. Did you complete the wire repair?	—	System OK	—

Lamps On Warning Alarm Does Not Sound With Ignition Off And Lamps On

Step		Value(s)	Yes	No
1	Using a scan tool, attempt to communicate with the truck body control module (TBC). Are you able to communicate with the truck body control module (TBC)?	—	Go to *Step 2*	Refer to *Section 8D* for TBC diagnosis
2	Using a scan tool, check truck body control module (TBC) for codes. Are there any truck body control module (TBC) codes present?	—	Refer to *Section 8D* for TBC diagnosis	Go to *Step 3*
3	1. Turn ignition to RUN. 2. Using a scan tool, read Park Lamps status. 3. Turn headlamp switch to PARK or HEAD. Does the scan tool indicate ON?	—	Go to *Step 4*	Go to *Step 10*

AUDIBLE WARNINGS

Step		Value(s)	Yes	No
4	1. Using a scan tool, read Ignition Power Mode status. 2. Turn ignition to OFF. Does the scan tool indicate OFF?	—	Go to *Step 5*	Go to *Step 6*
5	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—
6	1. Disconnect truck body control module (TBC). 2. Connect a test lamp between CKT 39 (PNK) wire cavity B2 connector C1 at TBC. Did the test lamp light?	—	Go to *Step 7*	Go to *Step 8*
7	Locate and repair short to voltage in CKT 39 (PNK) wire. Did you complete the wire repair?	—	System OK	—
8	Connect a test lamp between CKT 41 (BRN) wire cavity B9 connector C1 at TBC. Did the test lamp light?	—	Go to *Step 9*	Go to *Step 5*
9	Locate and repair short to voltage in CKT 41 (BRN) wire. Did you complete the wire repair?	—	System OK	—
10	1. Disconnect truck body control module (TBC). 2. Connect a test lamp between CKT 2409 (BRN) wire and ground. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 11*
11	Locate and repair open CKT 2409 (BRN) wire. Did you complete the wire repair?	—	System OK	—

Turn Signal Reminder Does Not Sound

Step		Value(s)	Yes	No
1	Using a scan tool, attempt to communicate with the truck body control module (TBC). Are you able to communicate with the truck body control module (TBC)?	—	Go to *Step 2*	Refer to *Section 8D* for TBC diagnosis
2	Using a scan tool, check truck body control module (TBC) for codes. Are there any truck body control module (TBC) codes present?	—	Refer to *Section 8D* for TBC diagnosis	Go to *Step 3*
3	1. Turn ignition to RUN. 2. Using a scan tool, read Left Turn Signal status. 3. Turn Turn the turn signal switch toward left. Does the scan tool indicate the left turn signal is ON?	—	Go to *Step 4*	Go to *Step 13*

Step		Value(s)	Yes	No
4	1. Using a scan tool, read Right Turn SignaL status. 2. Turn Turn the turn signal switch toward Right. Does the scan tool indicate the right turn signal is ON?	—	Go to *Step 5*	Go to *Step 11*
5	1. Using a scan tool, read Vehicle Speed status. 2. Drive vehicle and observe vehicle speed status. Does the scan tool show vehicle speed varying proportionally with the actual speed of the vehicle?	—	Go to *Step 6*	Go to *Step 7*
6	Replace truck body control module (TBC). Did you complete the truck body control module (TBC) replacement?	—	Refer to *Section 8D* for truck body control module (TBC) replacement procedures.	—
7	1. Disconnect truck body control module (TBC). 2. Disconnect SP200. 3. Connect a digital multimeter between CKT 817 (DK GRN/WHT) wire cavity B1 connector C2 at TBC and cavity E at SP200. Is the resistance less than the specified value?	0.5 Ω	Go to *Step 9*	Go to *Step 8*
8	Locate and repair open CKT 817 (DK GRN/WHT) wire. Did you complete the wire repair?	—	System OK	—
9	Connect a self-powered test lamp between CKT 817 (DK GRN/WHT) wire cavity B1 at connector C2 of TBC and ground. Did the test lamp light?	—	Go to *Step 10*	Refer to *Section 6* for VSS diagnosis.
10	Locate and repair short to ground in CKT 817 (DK GRN/WHT) wire between TBC and SP200. Did you complete the wire repair?	—	System OK	—
11	1. Disconnect truck body control module (TBC). 2. Connect a test lamp between CKT 1415 (DK BLU/WHT) wire cavity B7 connector C1 at TBC and ground. 3. Turn Turn the turn signal switch toward right. Does the test lamp flash with the turn signal?	—	Go to *Step 6*	Go to *Step 12*
12	Locate and repair open CKT 1415 (DK BLU/WHT) wire between TBC and SP204. Did you complete the wire repair?	—	System OK	—
13	1. Disconnect truck body control module (TBC). 2. Connect a test lamp between CKT 1414 (LT BLU/WHT) wire cavity B6 connector C1 at TBC and ground. 3. Turn Turn the turn signal switch toward left. Does the test lamp flash with the turn signal?	—	Go to *Step 6*	Go to *Step 14*
14	Locate and repair open CKT 1414 (LT BLU/WHT) wire between TBC and SP204. Did you complete the wire repair?	—	System OK	—

CIRCUIT OPERATION

With the ignition switch in START or RUN, voltage is supplied to the truck body control module (TBC) through fuse 4 and the CKT 39 (PNK) wire and fuse 3 and the CKT 41 (BRN) wire.

SAFETY BELT REMINDER

The chime will sound for 6 seconds when the ignition switch is turned from the OFF position to the RUN position and the seat belt is unfastened. The seat belt reminder on the IPC will also turn on.

KEY-IN REMINDER

The chime will sound when the ignition switch is not in the RUN or CRANK position and the ignition key is in the ignition key cylinder and the drivers door is opened.

HEAD LAMP REMINDER

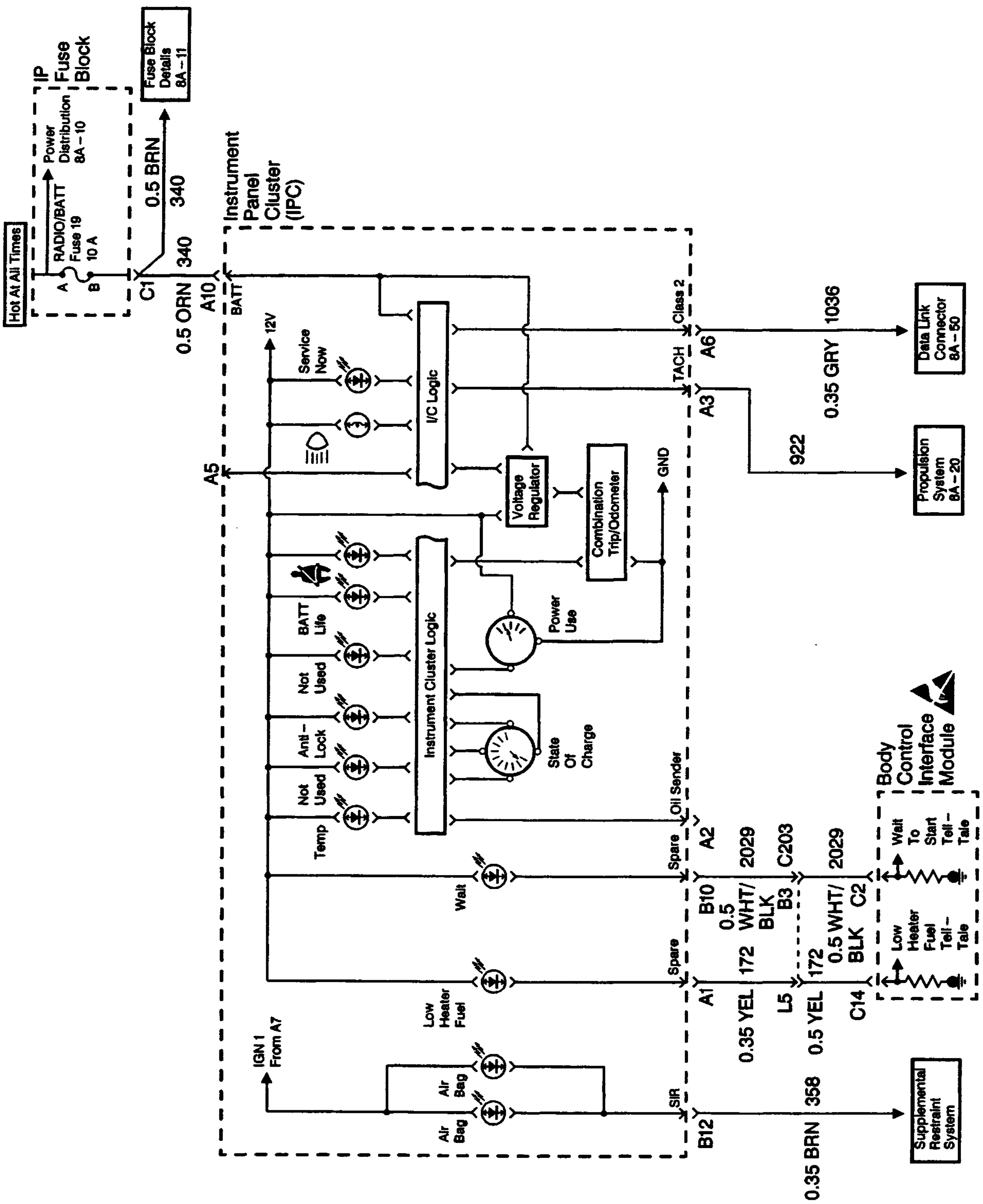
The chime will sound when the head lamp switch is in the PARK or HEAD position and the IP dimming switch is not at the maximum dimming state and the ignition switch is in the OFF or ACC position.

TURN SIGNAL REMINDER

The chime will sound when the right or left turn signal is turned on for more than 0.75 miles. the chime will be synchronous with the turn signal flasher.

BLANK

INSTRUMENT CLUSTER: ANALOG


Hot At All Times
IP Fuse Block
RADIO/BATT Fuse 19 10 A
A
B
Power Distribution 8A-10
C1
340
0.5 BRN
340
Fuse Block Details 8A-11
0.5 ORN
A10
BATT
Instrument Panel Cluster (IPC)
12V
Service Now
I/C Logic
A5
Voltage Regulator
Combination Trip/Odometer
GND
Power Use
BATT Life
Not Used
Anti-Lock
Not Used
Temp
Instrument Cluster Logic
State Of Charge
Oil Sender
Class 2
A6
1036
0.35 GRY
Data Link Connector 8A-50
TACH
A3
922
Propulsion System 8A-20
Spare
A2
2029
B10
0.5 WHT/BLK
B3
C203
2029
0.5 WHT/BLK
C2
Wait
Spare
A1
172
0.35 YEL
L5
172
0.5 YEL
C14
Low Heater Fuel
Body Control Interface Module
Wait To Start Tell-Tale
Low Heater Fuel Tell-Tale
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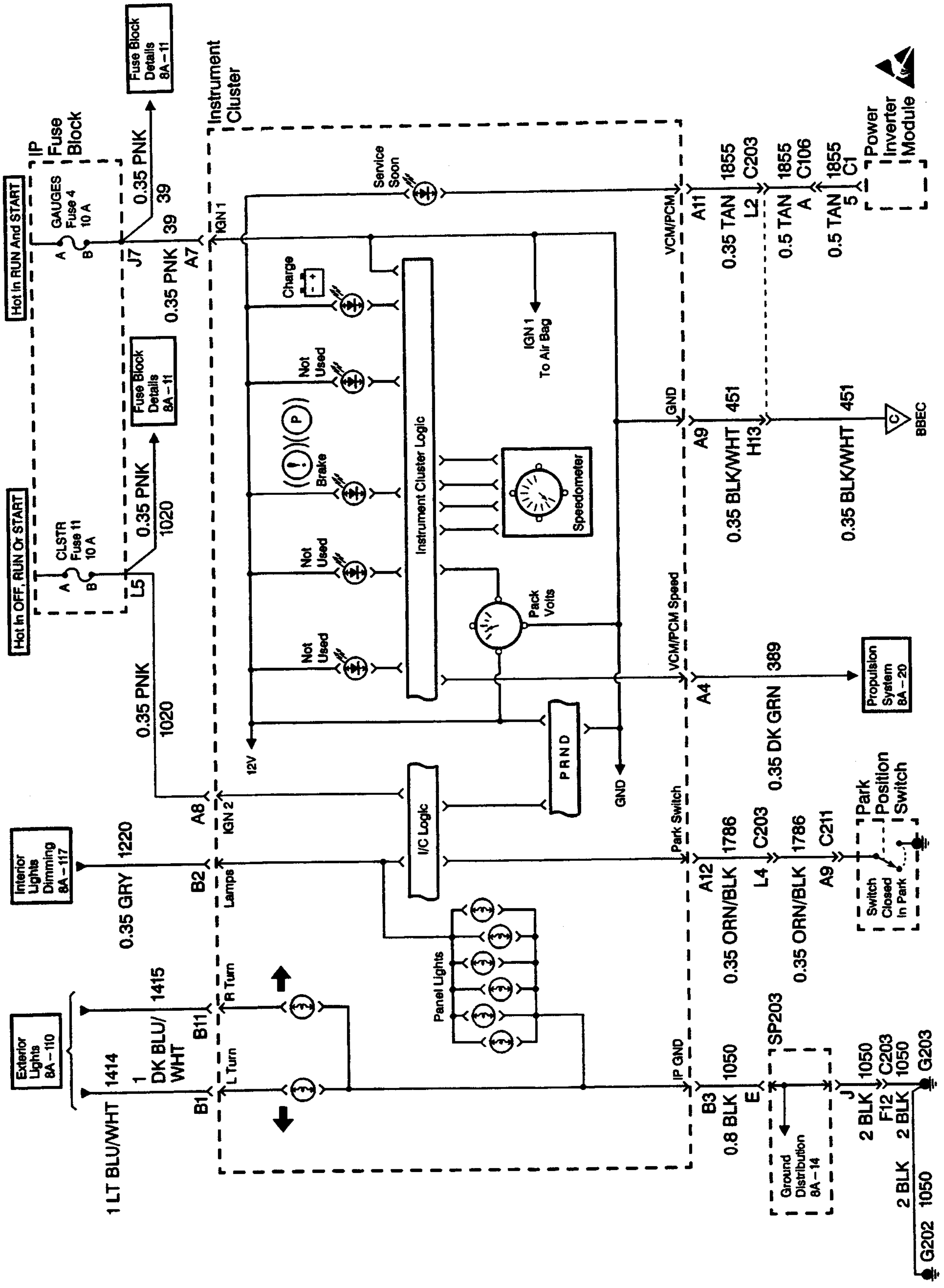
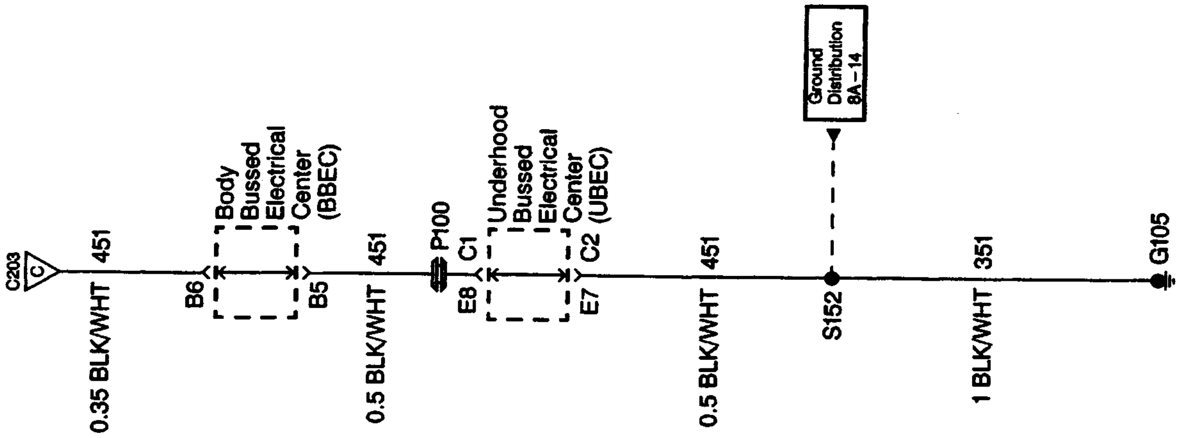
Air Bag
Air Bag
SIR
B12
358
0.35 BRN
Supplemental Restraint System


Hot In RUN And START
GAUGES
Fuse 4
10 A
IP
Fuse
Block
A
B
J7
0.35 PNK
39
Fuse Block
Details
8A-11
Hot In OFF, RUN Or START
CLSTR
Fuse 11
10 A
L5
0.35 PNK
1020
A7
A8
Instrument
Cluster
IGN 1
IGN 2
Service
Soon
Charge
Not
Used
Brake
Not
Used
Not
Used
Instrument Cluster Logic
IGN 1
To Air Bag
Speedometer
Pack
Volts
PRND
12V
GND
I/C Logic
Panel Lights
Lamps
R Turn
L Turn
VCM/PCM
GND
VCM/PCM Speed
Park Switch
IP GND
A11
0.35 TAN
1855
L2
C203
0.5 TAN
A
C106
0.5 TAN
5
C1
Power
Inverter
Module
A9
0.35 BLK/WHT
451
H13
0.35 BLK/WHT
451
BBEC
A4
0.35 DK GRN
389
Propulsion
System
8A-20
A12
0.35 ORN/BLK
1786
L4
C203
0.35 ORN/BLK
1786
A9
C211
Park
Position
Switch
Switch
Closed
In Park
Interior
Lights
Dimming
8A-117
0.35 GRY
1220
B2
Exterior
Lights
8A-110
1 LT BLU/WHT
1414
1
DK BLU/
WHT
1415
B1
B11
B3
0.8 BLK
1050
E
SP203
Ground
Distribution
8A-14
J
2 BLK
1050
F12
C203
2 BLK
1050
G203
2 BLK
1050
G202

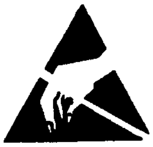
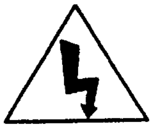
INSTRUMENT CLUSTER: ANALOG


C203
C
451
0.35 BLK/WHT
B6
Body Bussed Electrical Center (BBEC)
B5
451
0.5 BLK/WHT
P100
C1
E8
Underhood Bussed Electrical Center (UBEC)
C2
E7
451
0.5 BLK/WHT
Ground Distribution 8A–14
S152
351
1 BLK/WHT
G105

Instrument Cluster Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Drive Motor Unit: 8A-20	8A-20-0
Data Link Connector: 8A-50	8A-50-0
Interior Lights: Dimming: 8A-117	8A-117-0

Instrument Cluster Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

NOTICE: This section contains only schematics and component locations. Refer to *Section 8C1* for instrument cluster diagnosis.

Instrument Cluster Component Location Table

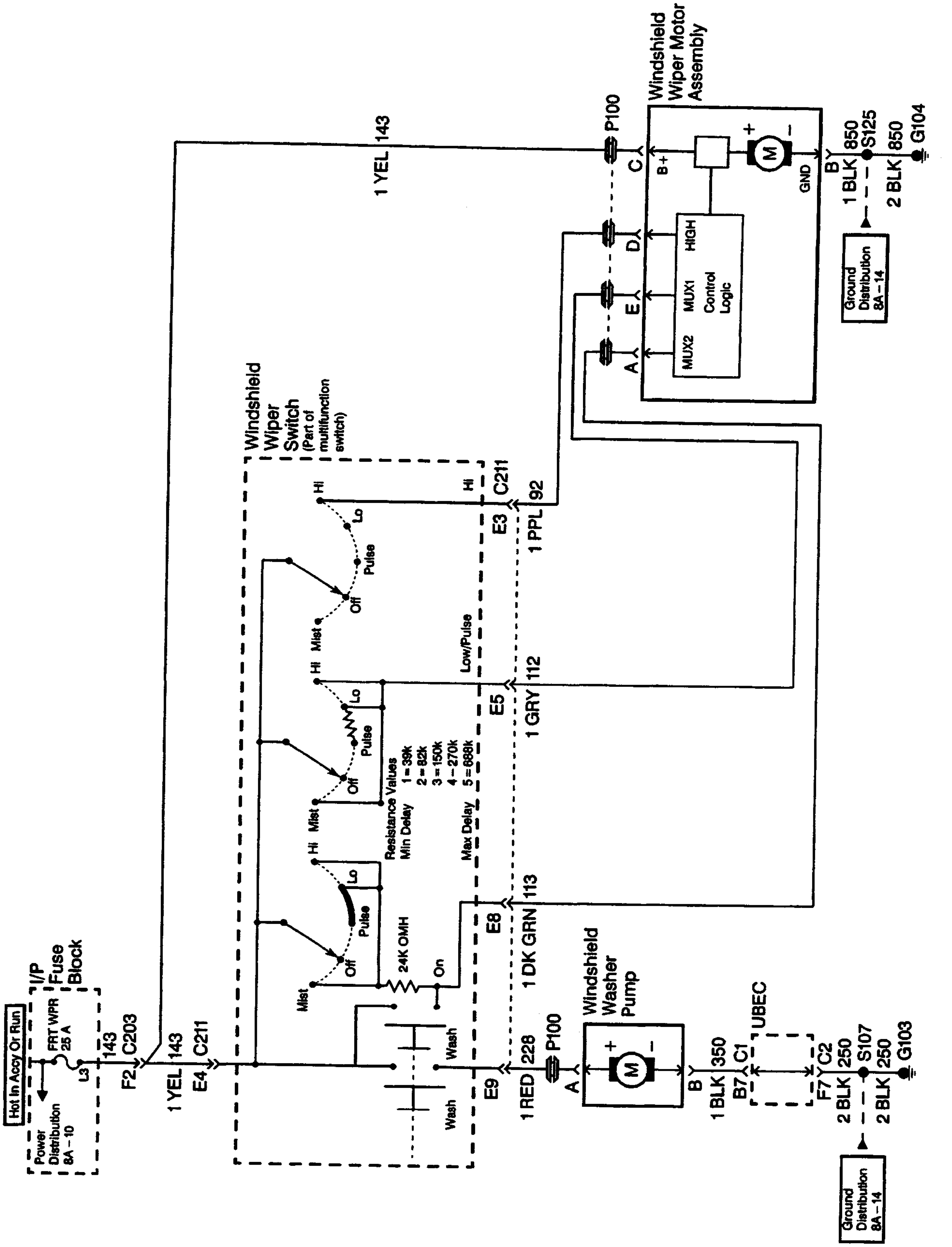
Name	Location	201-Pg	Fig.	Conn.
Body Bussed Electrical Center	Behind center of IP			78
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
Park Position Switch	On steering column			
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82

INSTRUMENT CLUSTER: ANALOG

Name	Location	201-Pg	Fig.	Conn.
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
G105	On top of LH frame rail, near windshield washer bottle			
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			

BLANK

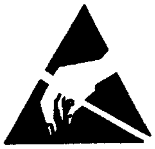
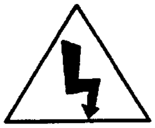
WIPER/WASHER: PULSE


Hot In Accy Or Run
I/P Fuse Block
FRT WPR 25 A
L3
Power Distribution 8A-10
143
C203
F2
1 YEL 143
E4 C211
1 YEL 143
Windshield Wiper Switch (Part of multifunction switch)
Hi
Lo
Pulse
Off
Mist
Hi
C211
E3
1 PPL 92
Low/Pulse
E5
1 GRY 112
Resistance Values
Min Delay
1 = 39k
2 = 82k
3 = 150k
4 = 270k
5 = 688k
Max Delay
24K OMH
On
Wash
E8
1 DK GRN 113
E9
1 RED 228
P100
A
Windshield Washer Pump
M
+
–
B
1 BLK 350
B7 C1
UBEC
F7 C2
2 BLK 250
S107
2 BLK 250
G103
Ground Distribution 8A-14
P100
C
D
E
A
Windshield Wiper Motor Assembly
B+
HIGH
MUX1
MUX2
Control Logic
GND
B
1 BLK 850
S125
2 BLK 850
G104
Ground Distribution 8A-14

Wiper/Washer Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0

Wiper/Washer Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Wiper/Washer Component Location Table

Name	Location	201-Pg	Fig.	Conn.
IP Fuse Block	LH side of instrument panel	33	34	76
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Windshield Washer Pump	In lower right side of windshield washer bottle	7	8	22
Windshield Wiper Motor	In engine compartment right of P/B booster, on bulkhead	10	11	42
Windshield Wiper Switch (Part Of Multifunction Switch)	Part of multifunction switch			
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
G103	On top of RH frame rail, near auxiliary battery	5	6	
G104	On top of RH frame rail, near auxiliary battery	5	6	
P100	Below brake master cylinder at bulkhead	25	26	
S107	Propulsion harness, approximately 5 cm left of inverter module breakout			
S125	Front body harness 20cm right of brake vacuum booster at top of bulkhead			

WIPER/WASHER: PULSE

Wiper/Washer Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Turn ignition switch to the RUN position without starting engine	Wipers run in the LO position	• *Wipers do not run in the LO position*
2	Turn wiper switch to the HI position	Wipers run in the HI position	• *Wipers do not run in the HI position*
3	Turn wiper switch to delay position.	Wipers delay properly in the delay position.	• *Wipers do not delay in the delay position.*
4	Press the washer switch	Wipers run and washers operate as long as the switch is depressed	• *Wipers do not operate but washers squirt* • *Washers do not operate but wipers wipe*
5	Perform steps 1-4	Wipers run in all positions	• *Wipers and washers do not operate in any position*
6	Turn the wipers off	Wipers turn off	• *Wipers do not turn off*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

Wipers Do Not Run In The LO Position

Step	Action	Value(s)	Yes	No
1	1. Disconnect 5-way connector at windshield wiper motor. 2. Connect a test lamp between CKT 143 (YEL) wire and ground. 3. Turn ignition switch to the run position. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open CKT 143 (YEL) wire. Did you complete the wire repair?	—	System OK	—
3	Connect a self-powered test lamp between CKT 850 (BLK) wire and ground. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT 850 (BLK) wire. Did you complete the wire repair?	—	System OK	—
5	1. Connect a digital multimeter between CKT 112 (GRY) wire and ground. 2. Turn wiper switch to LO position. Is the voltage above the specified value?	12 volts	Go to *Step 8*	Go to *Step 6*
6	1. Disconnect C211. 2. Connect a digital multimeter between CKT 113 (DK GRN) wire at C211 cavity E5 and CKT 113 (DK GRN) wire at windshield wiper motor connector. Is the resistance less than the specified value?	0.5 Ω	Go to *Step 11*	Go to *Step 7*
7	Locate and repair open CKT 112 (GRY) wire. Did you complete the wire repair?	—	System OK	—
8	1. Connect a digital multimeter between CKT 113 (DK GRN) wire and ground. 2. Turn wiper switch to LO position. Is the voltage above the specified value?	12 volts	Go to *Step 9*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
9	Replace windshield wiper motor. Did you complete the component replacement?	—	System OK	—
10	1. Disconnect C211. 2. Connect a digital multimeter between CKT 113 (DK GRN) wire at C211 cavity E5 and CKT 113 (DK GRN) wire at windshield wiper motor connector. Is the resistance less than the specified value?	0.5 Ω	Go to *Step 11*	Go to *Step 12*
11	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—
12	Locate and repair open CKT 113 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—

Wipers Do Not Run In The HI Position

Step	Action	Value(s)	Yes	No
1	Do the wipers wipe at low speed with the wiper switch in the high position?	—	Go to *Step 3*	Go to *Step 2*
2	Replace windshield wiper motor. Did you complete the windshield wiper motor replacement?	—	System OK	—
3	1. Disconnect 5-way connector at windshield wiper motor. 2. Connect a test lamp between CKT 112 (GRY) wire and ground. 3. Turn ignition to the run position. 4. Turn wiper switch to the HI position. Does the test lamp light?	—	Go to *Step 2*	Go to *Step 4*
4	1. Disconnect C211. 2. Connect a digital multimeter between CKT 112 (GRY) wire cavity E5 at C211 and CKT 112 (GRY) wire at windshield wiper motor connector. Is the resistance less than the specified value?	0.5 Ω	Go to *Step 5*	Go to *Step 6*
5	Replace windshield wiper switch assembly. Did you complete the component replacement?	—	System OK	—
6	Locate and repair open CKT 112 (GRY) wire. Did you complete the wire repair?	—	System OK	—

Wipers Do Not Delay In The Delay Position

Step	Action	Value(s)	Yes	No
1	Do the wipers wipe once and then stop in the delay position?	—	Go to *Step 2*	Go to *Step 3*
2	Locate and repair open CKT 112 (GRY) wire. Did you complete the wire repair?	—	System OK	—

WIPER/WASHER: PULSE

Step	Action	Value(s)	Yes	No
3	1. Disconnect 5-way connector at windshield wiper motor. 2. Connect a digital multimeter between CKT 112 (GRY) wire and ground. 3. Turn ignition to the run position. 4. Move wiper switch from max delay to min delay and observe voltage. Does the voltage vary directly with the turning of the delay switch?	—	Go to *Step 4*	Go to *Step 5*
4	Replace windshield wiper motor assembly. Did you complete the component replacement?	—	System OK	—
5	1. Disconnect C211. 2. Connect a digital multimeter between CKT 112 (GRY) wire cavity E5 steering column side of C211 and CKT 143 (YEL) wire cavity E4 steering column side of C211. 3. Move wiper switch from max delay to min delay and observe resistance. Does the resistance vary directly with the turning of the delay switch?	—	Go to *Step 6*	Go to *Step 7*
6	Locate and repair short to voltage in CKT 112 (GRY) wire. Did you complete the wire repair?	—	System OK	—
7	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—

Wipers Do Not Operate But Washers Squirt

Step	Action	Value(s)	Yes	No
1	1. Disconnect 5-way connector at windshield wiper motor. 2. Connect a test lamp between CKT 143 (YEL) wire and ground. 3. Turn ignition to the run position. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open CKT 143 (YEL) wire. Did you complete the wire repair?	—	System OK	—
3	1. Connect a test lamp between CKT 113 (DK GRN) wire and ground. 2. Press the washer switch. Does the test lamp light while the washer switch is pressed?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT 113 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
5	Connect a self-powered test lamp between CKT 850 (BLK) wire and ground. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Replace windshield wiper motor. Did you complete the component replacement?	—	System OK	—
7	Locate and repair open CKT 850 (BLK) wire. Did you complete the wire repair?	—	System OK	—

Washers Do Not Operate But Wipers Wipe

Step	Action	Value(s)	Yes	No
1	1. Disconnect windshield washer pump. 2. Connect a test lamp between CKT 228 (RED) wire and ground. 3. Press the washer switch. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open CKT 228 (RED) wire. Did you complete the wire repair?	—	System OK	—
3	Connect a self-powered test lamp between CKT 350 (BLK) wire and ground. Does the test lamp light?	—	Go to *Step 4*	Go to *Step 5*
4	Replace windshield washer pump. Did you complete the component replacement?	—	System OK	—
5	Locate and repair open CKT 350 (BLK) wire. Did you complete the wire repair?	—	System OK	—

Wipers And Washers Do Not Operate In Any Position

Step	Action	Value(s)	Yes	No
1	Inspect fuse 17. Is fuse 17 open?	—	Go to *Step 2*	Go to *Step 23*
2	1. Disconnect C211. 2. Disconnect 5-way connector at windshield wiper motor. 3. Connect a self-powered test lamp between CKT 143 (YEL) wire cavity E4 in C211 and ground. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Locate and repair short to ground in CKT 143 (YEL) wire. Did you complete the wire repair?	—	System OK	—
4	Connect a self-powered test lamp between CKT 113 (DK GRN) wire cavity E8 at C211 and ground. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 6*
5	Locate and repair short to ground in CKT 113 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
6	Connect a self-powered test lamp between CKT 112 (GRY) wire cavity E5 at C211 and ground. Does the test lamp light?	—	Go to *Step 7*	Go to *Step 8*
7	Locate and repair short to ground in CKT 112 (GRY) wire. Did you complete the wire repair?	—	System OK	—
8	Connect a self-powered test lamp between CKT 92 (PPL) wire cavity E3 at C211 and ground. Does the test lamp light?	—	Go to *Step 9*	Go to *Step 10*

WIPER/WASHER: PULSE

Step	Action	Value(s)	Yes	No
9	Locate and repair short to ground in CKT 92 (PPL) wire. Did you complete the wire repair?	—	System OK	—
10	Connect a self-powered test lamp between CKT 228 (RED) wire cavity E9 at C211 and ground. Does the test lamp light?	—	Go to *Step 11*	Go to *Step 12*
11	Locate and repair short to ground in CKT 228 (RED) wire and ground. NOTE: Be sure to check the windshield washer pump motor for a short in the windings that could also be opening fuse 17. Did you complete the wire repair?	—	System OK	—
12	1. Connect a self-powered test lamp between CKT 113 (DK GRN) wire cavity E8 at steering column side of C211 and ground. 2. Turn wiper switch to the HI position. Does the test lamp light?	—	Go to *Step 13*	Go to *Step 14*
13	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—
14	Connect a self-powered test lamp between CKT 112 (GRY) wire cavity E5 at steering column side of C211 and ground. Does the test lamp light?	—	Go to *Step 15*	Go to *Step 16*
15	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—
16	Connect a self-powered test lamp between CKT 92 (PPL) wire cavity E3 at steering column side of C211 and ground. Does the test lamp light?	—	Go to *Step 17*	Go to *Step 18*
17	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—
18	1. Connect a self-powered test lamp between CKT 228 (RED) wire cavity E9 at steering column side of C211 and ground. 2. Press the washer switch. Does the test lamp light?	—	Go to *Step 19*	Go to *Step 20*
19	Replace windshield wiper switch. Did you complete the component replacement?	—	System OK	—
20	1. Reconnect C211 and the 5-way connector at the windshield wiper motor. 2. Remove fuse 17. 3. Connect a digital multimeter between the fuse cavities (put a fused jumper between one of the cavities and one lead from the multimeter with a 25 amp fuse installed in the jumper). 4. Turn wipers to low and observe multimeter. Did the current exceed the specified value or did the fuse in the fused jumper open?	25 amps	Go to *Step 21*	Go to *Step 22*
21	Replace windshield wiper motor. Did you complete the component replacement?	—	System OK	—

Step	Action	Value(s)	Yes	No
22	Locate and repair intermittent short to ground in windshield wiper circuitry. HINT: Try tilting the tilt wheel, if equipped, while running the wipers. If the fuse blows, then you know the short is in the wiper switch wiring in the column. Did you complete the wire repair?	—	System OK	—
23	1. Disconnect 5-way connector at windshield wiper motor. 2. Connect a test lamp between CKT 143 (YEL) wire and ground. 3. Turn ignition switch to run. Does the test lamp light?	—	Go to *Step 24*	Go to *Step 27*
24	1. Disconnect C211. 2. Connect a test lamp between CKT 143 (YEL) wire cavity E4 and ground. Does the test lamp light?	—	Go to *Step 25*	Go to *Step 26*
25	Replace windshield wiper switch. Did you complete the wire repair?	—	System OK	—
26	Locate and repair open CKT 143 (YEL) wire between C203 and C211. Did you complete the wire repair?	—	System OK	—
27	Remove fuse 17 and connect a test lamp between ground and each terminal in the IP fuse block for fuse 17. Did the test lamp light at one of the terminals?	—	Go to *Step 28*	Go to *Step 29*
28	Locate and repair open CKT 143 (YEL) wire. Did you complete the wire repair?	—	System OK	—
29	Locate and repair power feed to fuse 17. Did you complete the wire repair?	—	System OK	—

Wipers Do Not Turn Off

Step	Action	Value(s)	Yes	No
1	1. Disconnect C211. 2. Turn ignition to run. Are the wipers running?	—	Go to *Step 2*	Go to *Step 3*
2	Locate and repair short to voltage in CKT 113 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
3	Replace windshield wiper switch. Did you complete the wire repair?	—	System OK	Go to *Step 5*

CIRCUIT OPERATION

WIPERS: PULSE

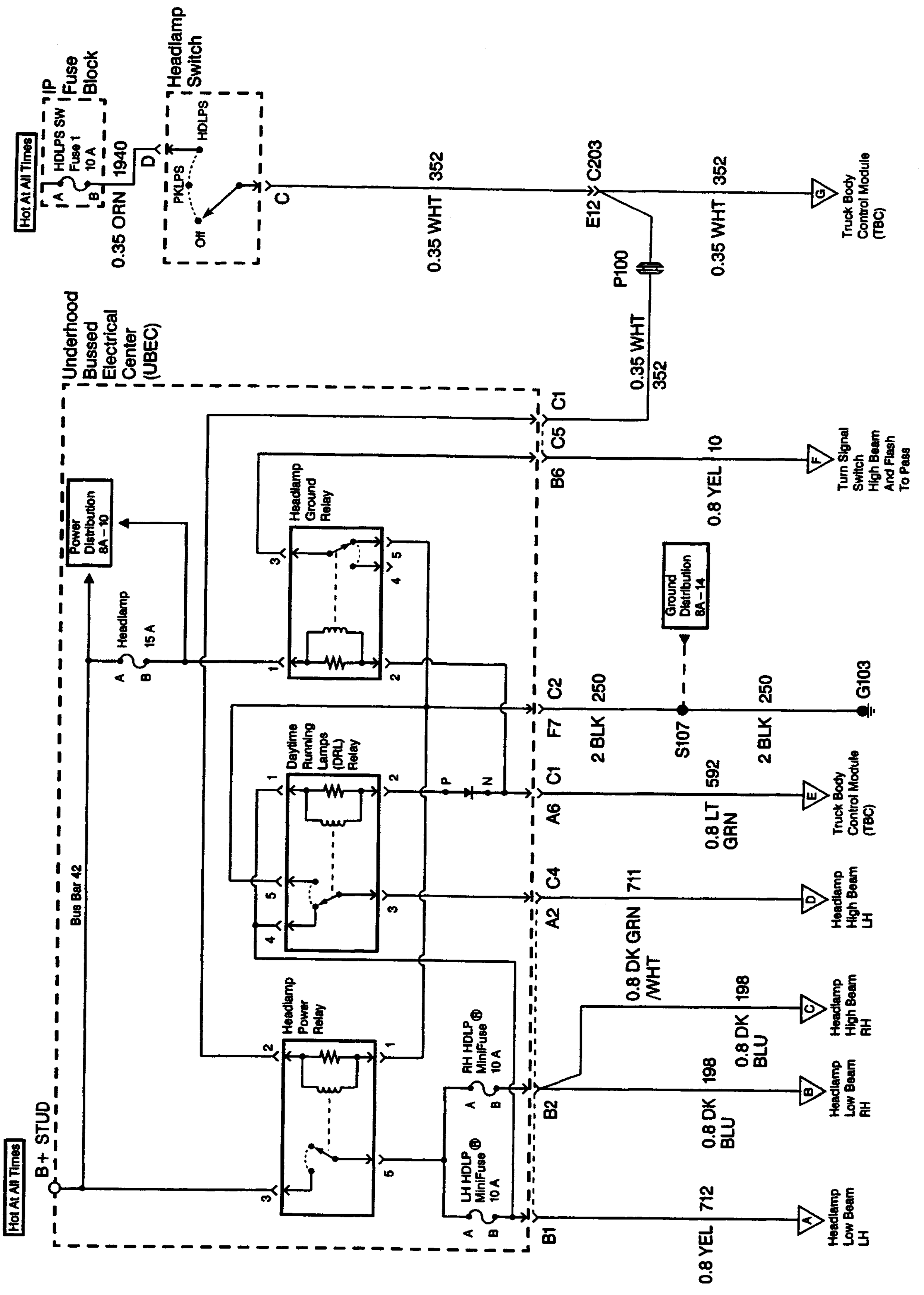
Voltage is applied in the ACC or RUN to the wiper/washer switch and wiper motor module through the CKT 143 (YEL) wire. With the wiper switch in HI position, voltage is directly applied the wiper motor module through CKT 92 (PPL) wire. The ground path is provided through CKT 850 (BLK) to G117 This will allow the wipers to cycle in the HI speed mode until the wiper switch is moved to the OFF position. With the wiper switch in the LO or Delay position, the wiper motor module receives a signal from the delay portion of the wiper switch. Based on the signal received, the module will control the wiper speed accordingly. The wipers will continue to operate at the selected delay speed until the wiper switch is turned to the OFF position.

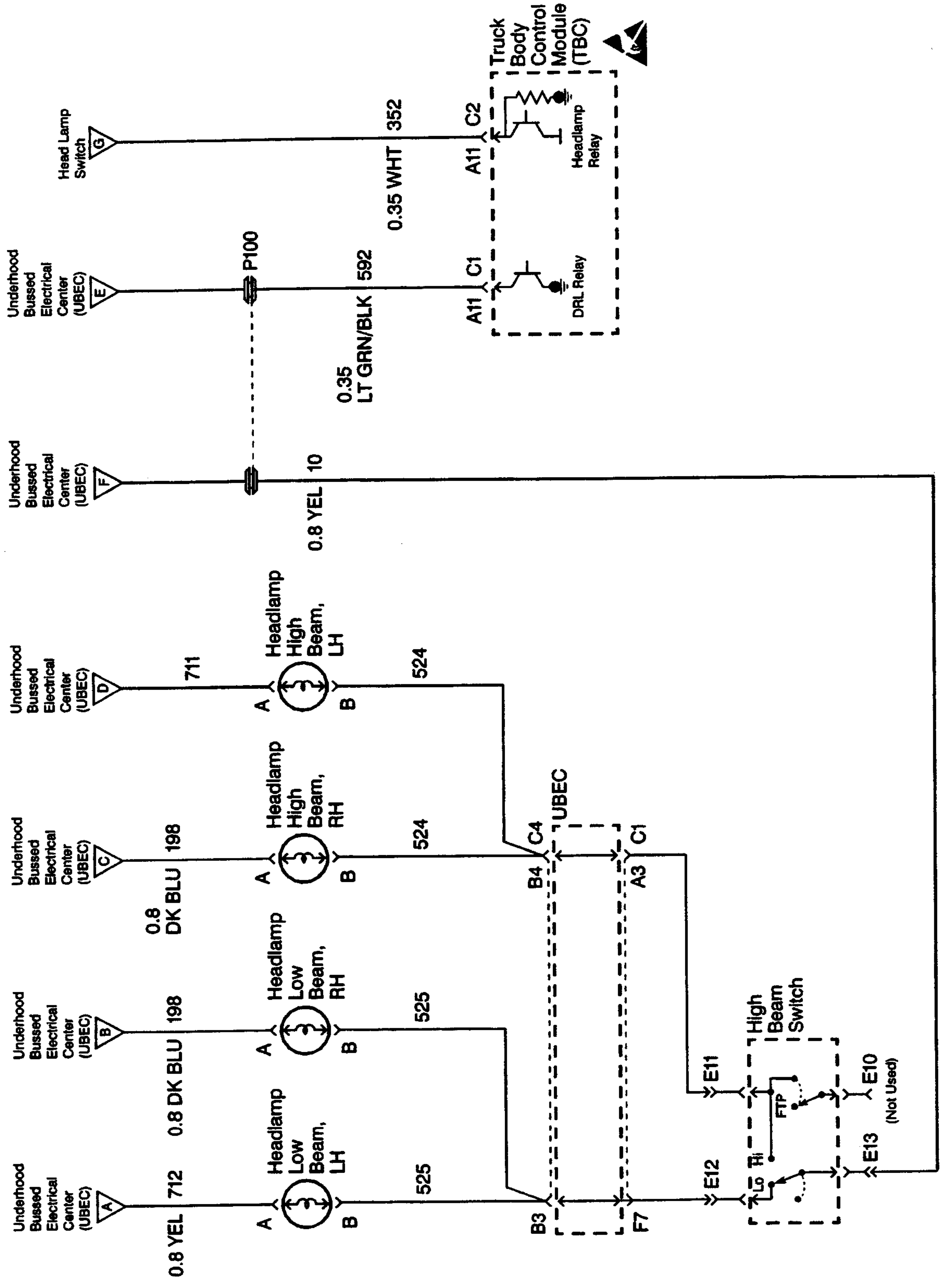
WASHER PUMP

Voltage is applied to the washer pump through CKT 228 (RED) wire from the wiper washer switch. The ground path is provided through CKT 350 (BLK) wire to G102. The wiper and washers will continue to operate when the washer switch is held in the wash position. When the washer switch is selected once, the module will control the amount of cycles of the wipers and washer based on logic built into the module.

BLANK

HEADLIGHTS: DAYTIME RUNNING LIGHTS (DRL)


Hot At All Times
HDLPS SW Fuse 1 10 A
A
B
IP Fuse Block
0.35 ORN
1940
D
Headlamp Switch
PKLPS
HDLPS
Off
C
0.35 WHT
352
C203
E12
P100
0.35 WHT
352
G
Truck Body Control Module (TBC)
Underhood Bussed Electrical Center (UBEC)
0.35 WHT
352
C1
C5
B6
0.8 YEL
10
F
Turn Signal Switch High Beam And Flash To Pass
Power Distribution 8A-10
Headlamp 15 A
A
B
Headlamp Ground Relay
3
4
5
1
2
Ground Distribution 8A-14
C2
F7
2 BLK
250
S107
2 BLK
250
G103
Daytime Running Lamps (DRL) Relay
1
2
P
N
5
4
3
C1
A6
0.8 LT GRN
592
E
Truck Body Control Module (TBC)
C4
A2
0.8 DK GRN /WHT
711
D
Headlamp High Beam LH
Bus Bar 42
Headlamp Power Relay
2
1
3
5
RH HDLP MiniFuse® 10 A
A
B
LH HDLP MiniFuse® 10 A
A
B
0.8 DK BLU
198
C
Headlamp High Beam RH
B2
0.8 DK BLU
198
B
Headlamp Low Beam RH
Hot At All Times
B+ STUD
B1
0.8 YEL
712
A
Headlamp Low Beam LH

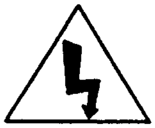

Underhood Bussed Electrical Center (UBEC)
A
0.8 YEL
712
Headlamp Low Beam, LH
A
B
525
Underhood Bussed Electrical Center (UBEC)
B
0.8 DK BLU
198
Headlamp Low Beam, RH
A
B
525
Underhood Bussed Electrical Center (UBEC)
C
0.8 DK BLU
198
Headlamp High Beam, RH
A
B
524
Underhood Bussed Electrical Center (UBEC)
D
711
Headlamp High Beam, LH
A
B
524
B3
B4
C4
UBEC
F7
A3
C1
High Beam Switch
E11
E12
E13
E10
(Not Used)
FTP
Hi
Lo
Underhood Bussed Electrical Center (UBEC)
F
0.8 YEL
10
Underhood Bussed Electrical Center (UBEC)
E
P100
0.35 LT GRN/BLK
592
A11
C1
DRL Relay
Head Lamp Switch
G
0.35 WHT
352
A11
C2
Headlamp Relay
Truck Body Control Module (TBC)

HEADLIGHTS: DAYTIME RUNNING LIGHTS (DRL)

Headlamps: Daytime Running Lamps Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0

Headlamps: Daytime Running Lamps Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Headlamps: Daytime Running Lamps Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Daytime Running Lamps (DRL) Relay	In underhood bussed electrical center (UBEC)	45	46	39
Headlamp Switch	Left of steering wheel, in IP	34	35	54
Headlamp, High Beam, LH	In left front corner of truck	54	55	8
Headlamp, High Beam, RH	In left front corner of truck	54	55	9
Headlamp, Low Beam, LH	In left front corner of truck	54	55	9
Headlamp, Low Beam, RH	In left front corner of truck	54	55	10
High-Beam Switch	Part of multifunction switch	3	4	
IP Fuse Block	LH side of instrument panel	33	34	76
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73

Name	Location	201-Pg	Fig.	Conn.
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
G103	On top of RH frame rail, near auxiliary battery	5	6	
P100	Below brake master cylinder at bulkhead	25	26	
S107	Propulsion harness, approximately 5 cm left of inverter module breakout			

DIAGNOSIS—HEADLAMPS: DAYTIME RUNNING LAMPS (DRL)

TROUBLESHOOTING HINTS:

1. CHECK the condition of LT HDLP Fuse 19, RT HDLP Fuse 20, FOG LP Fuse 28 and HDLP SWITCH Fuse 1. If any fuse is open, LOCATE and REPAIR cause of overload and REPLACE fuse.
2. CHECK that G102 is clean and tight.
3. CHECK for an open or shorted filament within the inoperative headlamp.
4. CHECK that DRL Relay, Headlamp Power Relay, and Headlamp Ground Relay are all securely connected.
   - CHECK for a broken (or partially broken) wire inside the insulation which could cause system malfunction but prove GOOD in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring for a voltage drop with the system operational (under load).
   - CHECK for proper installation of aftermarket electronic equipment which may affect the integrity of other systems (Refer to Troubleshooting Procedures, Page 8A-4-0)

ALL HEADLAMPS (INCLUDING DRL) ARE INOPERATIVE

TEST	RESULT	ACTION
1. Place Headlamp Switch in HDLP position. Connect a test lamp from LT HDLP Fuse, pin B to ground and RT HDLP Fuse, pin B to ground.	Test lamp lights at both fuses.	GO to step 6.
	Test lamp does not light at both fuses.	GO to step 2.
2. Connect a test lamp from CKT 1940 (ORN) wire at Headlamp Switch to ground.	Test lamp lights.	GO to step 3.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 1940 (ORN) circuit between the IP Fuse Block and the Headlamp Switch.
3. Connect test lamp from CKT 352 (WHT) wire at Headlamp Switch to ground.	Test lamp lights.	GO to step 4.
	Test lamp does not light.	REPLACE Headlamp Switch.
4. Connect a test lamp from pin 1 of the Headlamp Power Relay to ground.	Test lamp lights.	GO to step 5.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 352 (WHT) circuit between the Headlamp Switch and the Headlamp Power Relay.
5. Remove Headlamp Power Relay. Connect a test lamp from pin 1 to pin 2 of the Headlamp Power Relay socket.	Test lamp lights.	REPLACE Headlamp Power Relay.
	Test lamp does not light.	LOCATE and REPAIR open in the CKT 250 (BLK) circuit between the Underhood Bussed Electrical Center (UBEC) and ground (G103).

HEADLIGHTS: DAYTIME RUNNING LIGHTS (DRL)

TEST	RESULT	ACTION
6. Remove connector from Multifunction Switch. Connect a test lamp from CKT 10 (YEL) wire at Multifunction Switch to ground.	Test lamp lights.	GO to step 7.
	Test lamp does not light.	REPLACE Multifunction Switch.
7. Remove Headlamp Ground Relay. Connect a self powered test lamp from pin 3 at the Headlamp Ground Relay to pin E13 at the Multifunction Switch.	Test lamp lights.	GO to step 8.
	Test lamp does not light.	LOCATE and REPAIR open in the CKT 10 (YEL) circuit between the Multifunction Switch and the UBEC.
8. Replace connector at Multifunction Switch. Connect a self powered test lamp between relay terminals 3 and 5 of the Headlamps Ground Relay.	Test lamp lights.	LOCATE and REPAIR open in the CKT 250 (BLK) circuit between the UBEC and ground G103.
	Test lamp does not light.	REPLACE Headlamp Ground Relay.

LOW BEAM HEADLAMPS INOPERATIVE, HIGH BEAM HEADLAMPS OPERATE NORMALLY

TEST	RESULT	ACTION
1. Place Headlamp Switch in HDLP position, Headlamp Dimmer Switch in Low Beam. With a test lamp, back probe between connector C203 terminal E12 and ground.	Test lamp lights.	REPLACE Multifunction Switch
	Test lamp does not light.	LOCATE and REPAIR open in CKT 525 (YEL) circuit between the Headlamp Low Beam Bulbs and the Multifunction Switch.

HIGH BEAM HEADLAMPS INOPERATIVE, LOW BEAM HEADLAMPS OPERATE NORMALLY

TEST	RESULT	ACTION
1. Place Headlamp Switch in HDLP position; Headlamp Dimmer Switch in High Beam. Connect a test lamp from CKT 524 (PPL) wire (pin E11) at Multifunction Switch to ground.	Test lamp lights.	REPLACE Multifunction Switch.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 524 (PPL) circuit between the Headlamp High Beam Bulbs and the Multifunction Switch.

ONE LOW BEAM HEADLAMP INOPERATIVE

TEST	RESULT	ACTION
1. Disconnect the inoperative headlamp connector. Place the Headlamp Switch in HDLP. Place the Multifunction Switch in Low Beam. Connect a test lamp from the inoperative headlamp terminal A to ground.	Test lamp lights.	GO to step 2.
	Test lamp does not light.	LOCATE and REPAIR open in LH CKT 712 (YEL) or RH CKT 198 (BLU) wire between the Headlamp Low Beam Bulb and the Underhood Bussed Electrical Center (UBEC).
2. Connect a test lamp from the inoperative headlamp terminal A to terminal B.	Test lamp lights.	REPLACE Headlamp Low Beam Bulb.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 525 (YEL) circuit between the inoperative headlamp and the UBEC.

RH HIGH BEAM HEADLAMP INOPERATIVE

TEST	RESULT	ACTION
1. Disconnect the inoperative headlamp connector. Place the Headlamp Switch in HDLP. Place the Multifunction Switch in High Beam. Connect a test lamp from the RH headlamp terminal A to ground.	Test lamp lights.	GO to step 2.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 198 (DK BLU) wire between the Headlamp High Beam Bulb and the Underhood Bussed Electrical Center (UBEC).
2. Connect a test lamp from the RH headlamp terminal A to terminal B.	Test lamp lights.	REPLACE Headlamp High Beam Bulb.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 524 (PPL) circuit between the inoperative headlamp and the UBEC.

LH HIGH BEAM HEADLAMP INOPERATIVE

TEST	RESULT	ACTION
1. Disconnect the LH headlamp connector. Place the Headlamp Switch in HDLP. Place the Multifunction Switch in High Beam. Connect a test lamp from the LH headlamp terminal A to ground.	Test lamp lights.	GO to step 2.
	Test lamp does not light.	GO to step 3.
2. Connect a test lamp from the LH headlamp terminal A to terminal B.	Test lamp lights.	REPLACE Headlamp High Beam Bulb.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 524 (PPL) circuit between the inoperative headlamp and the UBEC.
3. Connect a test lamp from DRL Relay pin 3 to ground.	Test lamp lights.	LOCATE and REPAIR open in CKT 711 (DK GRN/WHT) circuit between the UBEC and the Headlamp High Beam Bulb, LH.
	Test lamp does not light.	REPLACE the DRL Relay.

DAYTIME RUNNING LAMPS INOPERATIVE—HEADLAMPS OPERATE NORMALLY

TEST	RESULT	ACTION
1. Remove DRL Relay from the Underhood Bussed Electrical Center (UBEC). Connect jumper wires between the pins and sockets for terminals 1 and 2. Connect a self powered test lamp from pin 3 to pin 5 of the DRL Relay.	Test lamp lights.	Inspect the relay connection in the UBEC.
	Test lamp does not light.	REPLACE the DRL Relay.

DAYTIME RUNNING LAMPS STAY ON

TEST	RESULT	ACTION
1. Remove the DRL Relay from the Underhood Bussed Electrical Center (UBEC).	Daytime Running Lamps remain on.	LOCATE and REPAIR short to ground in the CKT 711 (DK GRN/WHT) circuit between the Headlamp High Beam Bulb, LH, and the UBEC.
	Daytime Running Lamps are off.	REPLACE the Daytime Running Lamps Relay.

HEADLIGHTS: DAYTIME RUNNING LIGHTS (DRL)

CIRCUIT OPERATION

HEADLAMPS—LOW BEAM

Voltage to the Headlamps Switch is available at all times through the HDLP SWITCH Fuse and the CKT 1940 (ORN) wire. When the Headlamp Switch is turned to the HDLP position, the Headlamp Power Relay coil is energized through the CKT 352 (WHT) wire. A signal is also sent to the Truck Body Control Module (TBCM) that the Headlamps are switched ON. When the Headlamp Switch is in the AUTO position, a light sensor located in the RH speaker grill senses a daylight or dark condition. The Truck Body Control Module (TBCM) will control the actuation of the Headlamp Power Relay, Headlamp Ground Relay, and the DRL Relay for DRL operation during a daylight condition. When the light sensor detects a dark condition, the Truck Body Control Module will produce a signal that will energize only the Headlight Power Relay, through the CKT 352 (WHT) wire. The Headlamp Power Relay coil is grounded through the Underhood Bussed Electrical Center (UBEC), through pin F7 of connector 2, and through the BLK (250) circuit to G103. The Headlamp Power Relay supplies current to both the LT HDLP and the RT HDLP fuses. The Headlamp Low Beam Bulb, LH receives current through the CKT 712 (YEL) wire. The Headlamp Low Beam Bulb, RH receives current through the CKT 198 (DK BLU) wire. Both Headlamp Low Beam Bulbs are grounded through a CKT 525 (YEL) circuit, through the UBEC, through the Multifunction Switch (Low position), back to the UBEC through the CKT 10 (YEL) circuit to the Headlamps Ground Relay. The Headlamps Ground Relay, and the DRL Relay are deenergized by the Truck Body Control Module (TBCM), providing a ground path through the normally open contacts of the Headlamps Ground Relay. The ground path is completed through the UBEC and to G103 through the CKT 250 (BLK) circuit.

HEADLAMPS—HIGH BEAM

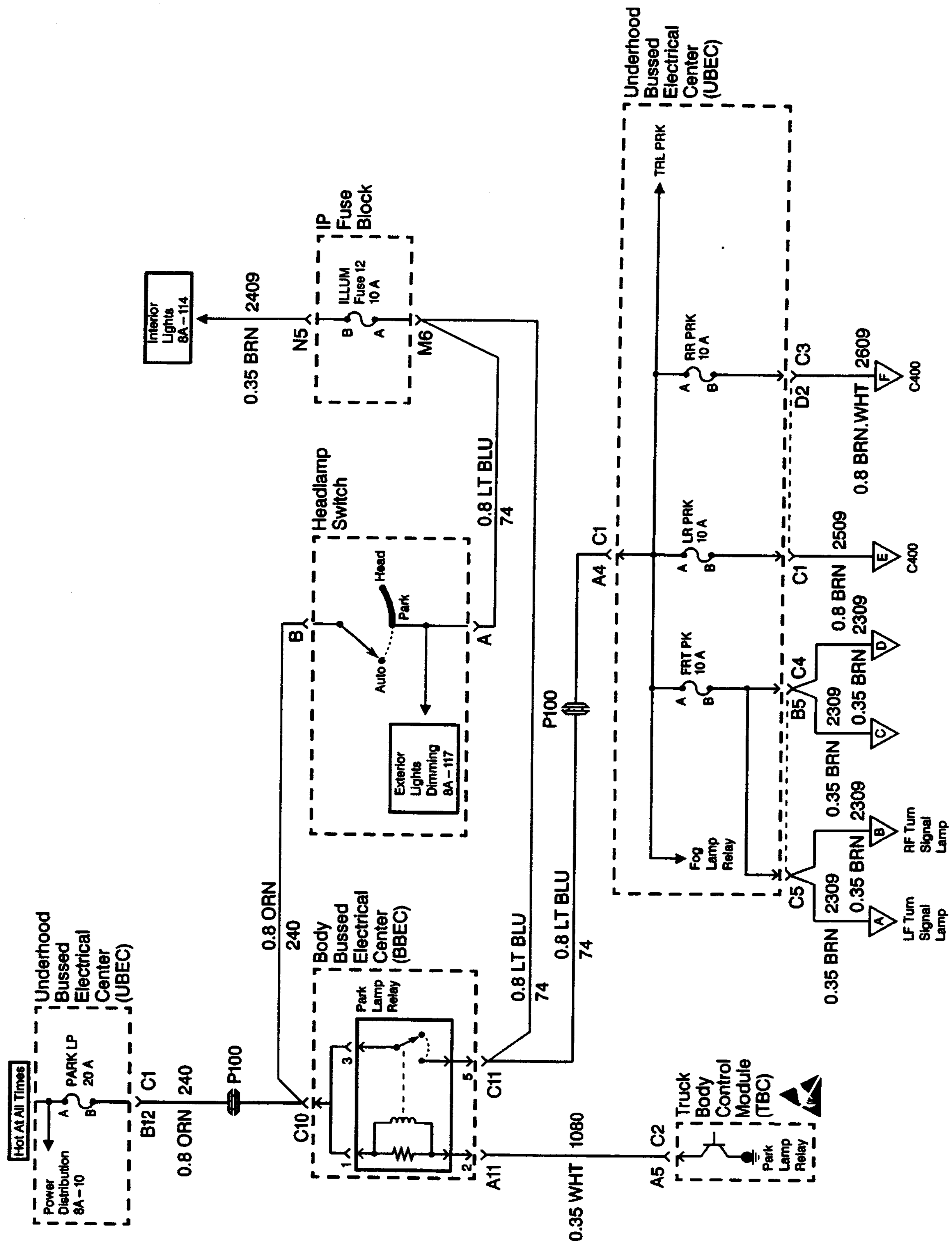
Voltage to the Headlamps Switch is available at all times through the HDLP SWITCH Fuse and the ORN (1940) wire. When the Headlamp Switch is turned to HDLP, the Headlamp Power Relay coil is energized through the CKT 352 (WHT) wire. A signal is also sent to the Truck Body Control Module that the Headlamps are switched on. The Headlamp Power Relay coil is grounded through the Underhood Bussed Electrical Center (UBEC), through pin F7 of connector 2, and through the CKT 350 (BLK) circuit to G102. The Headlamp Power Relay supplies current to both the LT HDLP and the RT HDLP fuses. The Headlamp High Beam Bulb, RH receives current through the CKT 198 (DK BLU) wire from the RT HDLP Fuse. When the Headlamps Switch is in the HDLP position, the Truck Body Control Module (TBCM) removes the ground path to the relay coil of the Headlamps Ground Relay and the DRL Relay. Both relays return to the normally open condition. The normally open contacts of the DRL Relay allows current to the Headlamp High Beam Bulb, LH, through the CKT 711 (GRN/WHT) circuit. Both Headlamp High Beam Bulbs are grounded through the CKT 524 (PPL) circuit through the UBEC, through the Multifunction Switch (High position), back through the UBEC, to the Headlamps Ground Relay. Because the relay is deenergized, the current flows through the normally open contacts of the relay, through the UBEC, and through the CKT 250 (BLK) circuit to G103. A voltage signal is sent to the Truck Body Control Module (TBCM), through the CKT 524 (PPL) wire, to confirm proper high beam operation.

HEADLAMPS—DAYTIME RUNNING LAMPS

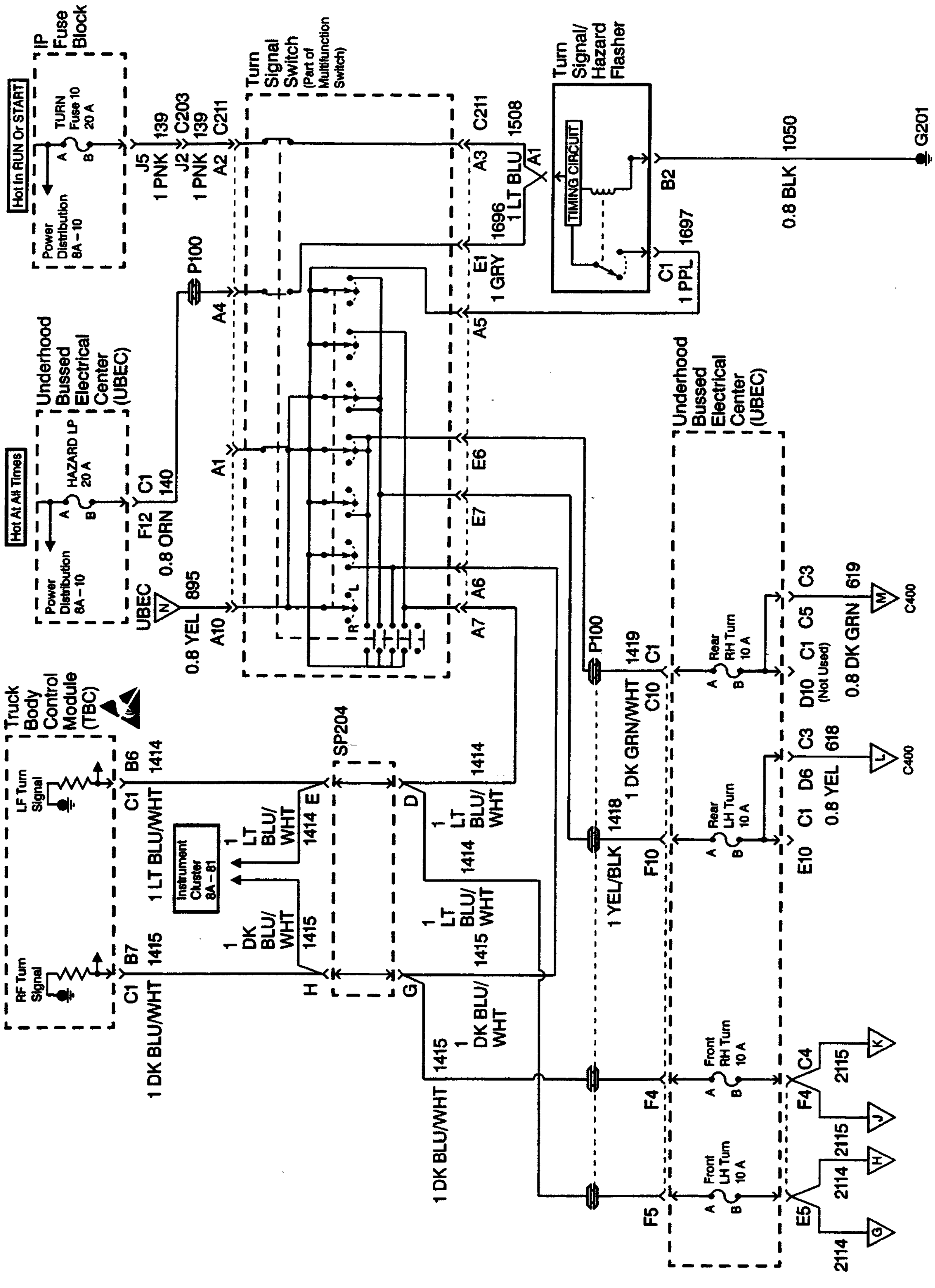
Voltage to the Headlamps Switch is available at all times through the HDLP SWITCH Fuse and the CKT 1940 (ORN) wire. When the Headlamp Switch is in the AUTO position, a light sensor located in the RH speaker grill senses a daylight or dark condition. The Truck Body Control Module (TBCM) will control the operation of the Headlamp Power Relay, Headlamp Ground Relay, and the DRL Relay for DRL operation during a daylight condition. The Headlamp Power Relay coil is grounded through the Underhood Bussed Electrical Center (UBEC), through pin F7 of connector 2, and through the CKT 250 (BLK) circuit to G103. The Headlamp High Beam Bulb, RH receives current through the CKT 198 (DK BLU) wire. The TBCM energizes the Headlamp Ground Relay and the DRL Relay. When the Headlamp Ground Relay is energized, the ground path for regular headlamp operation is eliminated. At the same time, the DRL Relay is energized, which now places both Headlamp High Beam Bulbs in series. This operation will cause both headlights to light at half normal output. The ground circuit for the Daytime Running Lights is through the CKT 711 (DK GRN/WHT) wire through the DRL Relay (closed contacts), through the UBEC, to the CKT 250 (BLK) circuit to G103. A voltage signal is sent to the Truck Body Control Module (TBCM), through the CKT 524 (PPL) wire, to confirm proper DRL operation.

BLANK

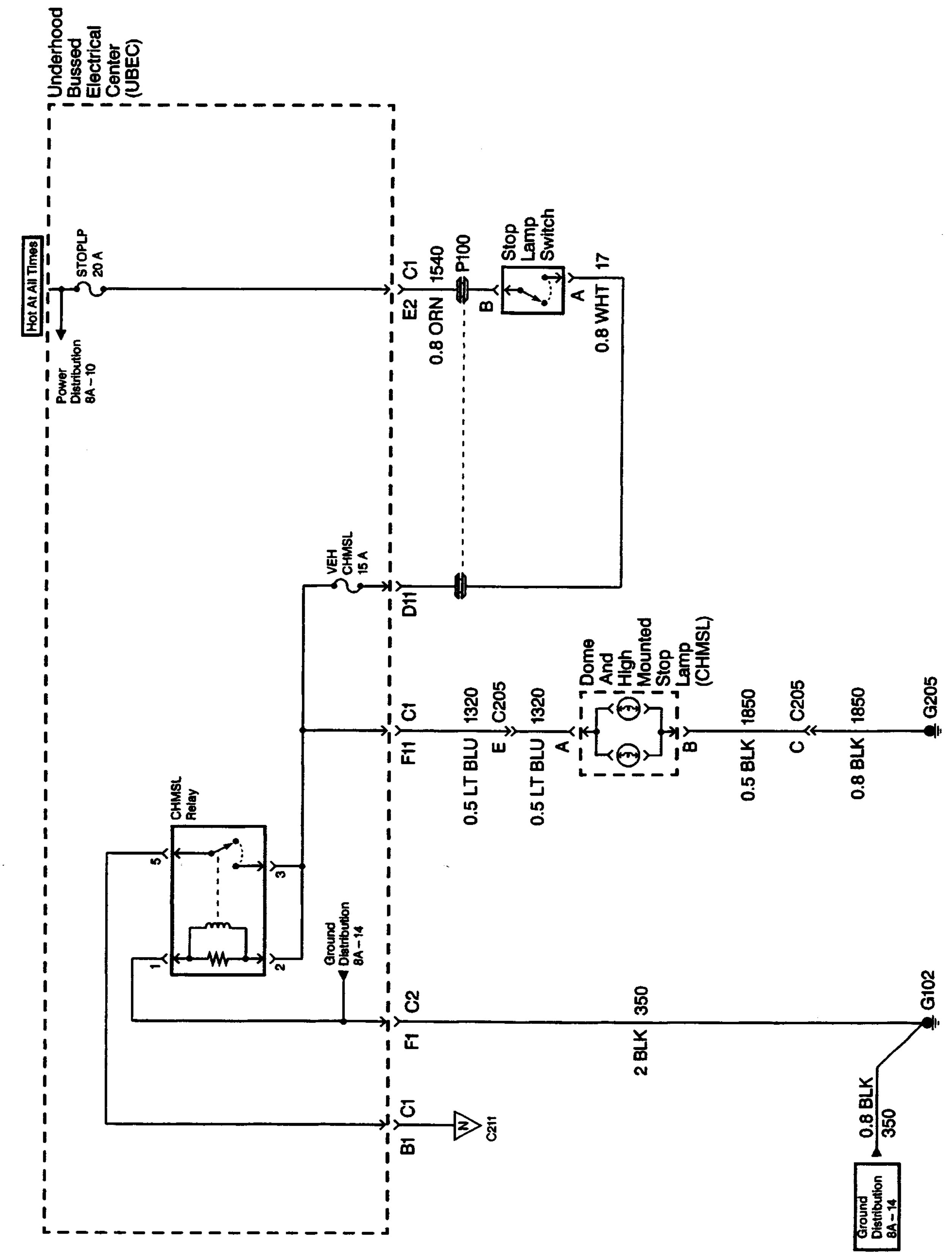
EXTERIOR LIGHTS

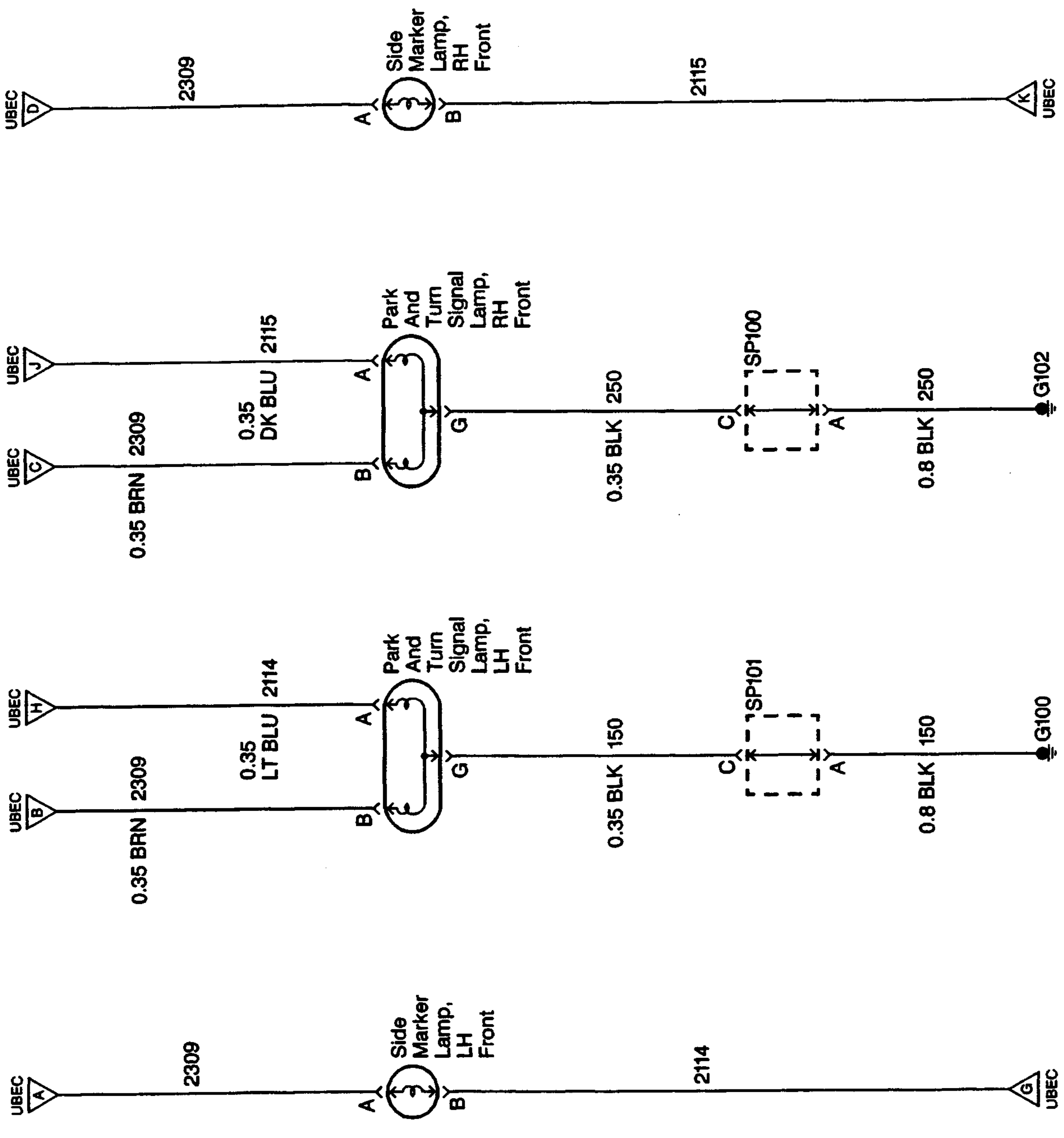


Hot At All Times
Underhood Bussed Electrical Center (UBEC)
Power Distribution 8A-10
PARK LP 20 A
A
B
C1
B12
0.8 ORN
240
P100
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
C10
C11
A11
1
2
3
5
0.8 ORN
240
0.8 LT BLU
74
0.35 WHT
1080
C2
A5
Truck Body Control Module (TBC)
Park Lamp Relay
Headlamp Switch
Head
Park
Auto
B
A
Exterior Lights Dimming 8A-117
0.8 LT BLU
74
IP Fuse Block
ILLUM Fuse 12 10 A
N5
M6
0.35 BRN
2409
Interior Lights 8A-114
P100
A4
C1
Underhood Bussed Electrical Center (UBEC)
TRL PRK
RR PRK 10 A
LR PRK 10 A
FRT PK 10 A
Fog Lamp Relay
C3
D2
0.8 BRN.WHT
2609
F
C400
C1
0.8 BRN
2509
E
C400
C4
B5
0.8 BRN
2309
D
0.35 BRN
2309
C
C5
0.35 BRN
2309
B
RF Turn Signal Lamp
0.35 BRN
2309
A
LF Turn Signal Lamp

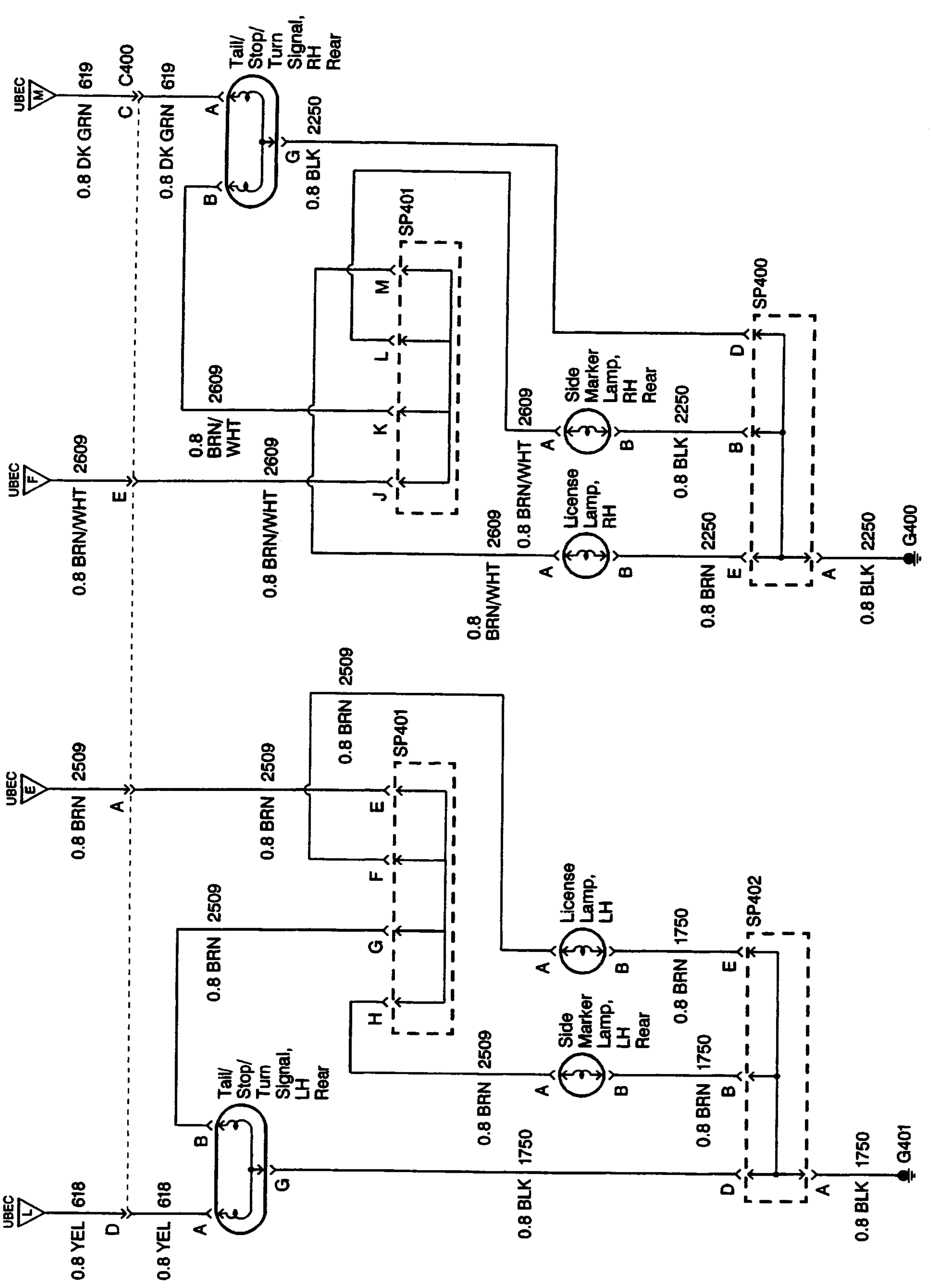

Hot In RUN Or START
IP Fuse Block
Power Distribution 8A-10
TURN Fuse 10 20 A
J5 1 PNK 139
C203
J2 1 PNK 139
A2 C211
Turn Signal Switch (Part of Multifunction Switch)
A3 C211
1508
A1 1 LT BLU
E1 1 GRY 1696
Turn Signal/ Hazard Flasher
TIMING CIRCUIT
B2
C1 1 PPL 1697
1050
0.8 BLK
G201
A5
P100
A4
Hot At All Times
Underhood Bussed Electrical Center (UBEC)
HAZARD LP 20 A
F12 C1 140
0.8 ORN
A1
E6
E7
A6
A7
UBEC N 895
0.8 YEL A10
L
R
Truck Body Control Module (TBC)
LF Turn Signal
B6 1414
C1 1 LT BLU/WHT
RF Turn Signal
B7 1415
C1 1 DK BLU/WHT
Instrument Cluster 8A-81
1 LT BLU/WHT 1414 E
1 DK BLU/WHT 1415 H
SP204
D 1 LT BLU/WHT 1414
1 LT BLU/WHT 1414
1 LT BLU/WHT 1415
G
1415 1 DK BLU/WHT
1 DK BLU/WHT
P100
1419 C1
1 DK GRN/WHT C10
1418
1 YEL/BLK F10
Underhood Bussed Electrical Center (UBEC)
Rear RH Turn 10 A
C1 C5 C3
D10 (Not Used)
0.8 DK GRN 619
M C400
Rear LH Turn 10 A
C1 D6 C3
0.8 YEL 618
L C400
E10
Front RH Turn 10 A
F4 F4 C4
2115
K
2115
J
Front LH Turn 10 A
F5 E5
2114
H
2114
G
A
B

EXTERIOR LIGHTS


Underhood Bussed Electrical Center (UBEC)
Hot At All Times
STOPLP 20 A
Power Distribution 8A-10
E2
C1
0.8 ORN
1540
P100
B
Stop Lamp Switch
A
0.8 WHT
17
VEH CHMSL 15 A
D11
F11
C1
0.5 LT BLU
1320
E
C205
0.5 LT BLU
1320
A
Dome And High Mounted Stop Lamp (CHMSL)
B
0.5 BLK
1850
C
C205
0.8 BLK
1850
G205
CHMSL Relay
5
3
1
2
Ground Distribution 8A-14
F1
C2
2 BLK
350
G102
0.8 BLK
350
Ground Distribution 8A-14
B1
C1
N
C211


UBEC
D
2309
A
Side Marker Lamp, RH Front
B
2115
K
UBEC
UBEC
J
UBEC
C
0.35 BRN
2309
0.35 DK BLU
2115
A
B
Park And Turn Signal Lamp, RH Front
G
0.35 BLK
250
C
SP100
A
0.8 BLK
250
G102
UBEC
H
UBEC
B
0.35 BRN
2309
0.35 LT BLU
2114
A
B
Park And Turn Signal Lamp, LH Front
G
0.35 BLK
150
C
SP101
A
0.8 BLK
150
G100
UBEC
A
2309
A
Side Marker Lamp, LH Front
B
2114
G
UBEC

EXTERIOR LIGHTS


UBEC
M
0.8 DK GRN
619
C
C400
0.8 DK GRN
619
A
B
Tail/
Stop/
Turn
Signal,
RH
Rear
G
0.8 BLK
2250
SP401
M
L
K
J
0.8
BRN/
WHT
2609
UBEC
F
0.8 BRN/WHT
2609
E
0.8 BRN/WHT
2609
Side
Marker
Lamp,
RH
Rear
A
B
0.8 BRN/WHT
2609
0.8 BLK
2250
SP400
D
B
License
Lamp,
RH
A
B
0.8
BRN/WHT
2609
0.8 BRN
2250
E
A
0.8 BLK
2250
G400
UBEC
E
0.8 BRN
2509
A
0.8 BRN
2509
0.8 BRN
2509
SP401
E
F
G
H
0.8 BRN
2509
License
Lamp,
LH
A
B
0.8 BRN
1750
E
SP402
Side
Marker
Lamp,
LH
Rear
A
B
0.8 BRN
2509
0.8 BRN
1750
B
Tail/
Stop/
Turn
Signal,
LH
Rear
B
A
G
UBEC
L
0.8 YEL
618
D
0.8 YEL
618
0.8 BLK
1750
D
A
0.8 BLK
1750
G401

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0
Instrument Cluster: 8A-81	8A-81-0
Interior Lighting: 8A-114	8A-114-0
Interior Lights: Dimming: 8A-117	8A-117-0

Exterior Lights Schematic Icon Table

Icon	Icon Definition
▲	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Exterior Lights Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Body Bussed Electrical Center	Behind center of IP			78
Dome Lamp and High Mounted Stop Lamp	Rear center of cab	50	51	34
Headlamp Switch	Left of steering wheel, in IP	34	35	54
High-Mounted Stop Light Relay	In underhood bused electrical center			
IP Fuse Block	LH side of instrument panel	33	34	76
License Lamp, LH	Left center of rear bumper	59	60	14
License Lamp, RH	Right center of rear bumper	59	60	14
Park Lamp Relay	In body bussed electrical center (BBEC)			
Park/Turn Signal Lamp, LH Front	Left front corner of front bumper	4	5	28
Park/Turn Signal Lamp, RH Front	Right front corner of front bumper	4	5	29
Side Marker Lamp, LH Front	Left front corner of vehicle	54	55	17
Side Marker Lamp, LH Rear	Left rear corner of vehicle	52	53	17
Side Marker Lamp, RH Front	Right front corner of vehicle	54	55	18
Side Marker Lamp, RH Rear	Right rear corner of vehicle	52	53	18
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
Tail/Stop/Turn Signal Lamp, LH Rear	Left rear corner of vehicle	52	53	29

EXTERIOR LIGHTS

Name	Location	201-Pg	Fig.	Conn.
Tail/Stop/Turn Signal Lamp, RH Rear	Right rear corner of vehicle	52	53	30
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Turn Signal/Hazard Flasher	Taped to harness below C204	63	64	48
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C3	At UBEC	53	54	72
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C205	Dome lamp harness to Front body harness, behind LH side of IP beneath IP speaker	50	51	102
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C400	Tail and stoplamps harness to chassis harness, under vehicle, at left rear of frame	66	67	95
G100	Left front of vehicle mounted to radiator core support by LH headlamp	4	5	
G102	On right front of vehicle, mounted to radiator core support, by RH headlamp	4	5	
G105	On top of LH frame rail, near windshield washer bottle			
G201	On power steering pump bracket	57	58	
G400	Right rear of vehicle on frame			
G401	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
SP100	Left front of vehicle mounted to radiator support			
SP101	Right front of vehicle mounted to radiator support	62	63	
SP204		63	64	
SP400	Mounted to left rear frame rail	52	53	
SP401	Mounted to left rear frame rail	66	67	
SP402	Mounted to right rear frame rail	66	67	

Exterior Lights Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Turn headlamp switch to PARK	Park lamps and license plate lamps turn on	• *None of the park lamps or license plate lamps operate* • *Neither of the front park lamps illuminate but the rear lights work* • *None of the left rear lamps operate, but the front park lamps work* • *None of the right rear lamps operate, but the front park lamps work* • *One of the exterior lamps is inoperative*
2	Turn on right turn signal	Right turn signal flashes on and off, indicator on dash flashes	• *Turn signals turn on but do not flash* • *None of the turn signals operate* • *One of the turn signals does not operate* • *Turn signal indicators on dash do not flash*
3	Turn on left turn signal	Left turn signal flashes on and off, indicator on dash flashes	• *Turn signals turn on but do not flash* • *None of the turn signals operate* • *One of the turn signals does not operate* • *Turn signal indicators on dash do not flash*
4	Apply service brakes	Brake lights illuminate	• *Brake lamps do not operate* • *One of the brake lights does not operate* • *CHMSL does not operate*
5	Turn on hazard flashers	All turn signals flash, both indicators on dash flash	• *Hazard Flashers turn on but do not flash* • *Turn signal indicators on dash do not flash*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

None Of The Park Lamps Or License Plate Lamps Operate

Step	Action	Value(s)	Yes	No
1	Inspect PARKLP fuse in the underhood bussed electrical center (UBEC). Is PARKLP fuse in the underhood bussed electrical center (UBEC) open?	—	Go to *Step 11*	Go to *Step 2*
2	Connect a test lamp between CKT 240 (ORN) wire at headlamp switch and ground. Does the test lamp light?	—	Go to *Step 4*	Go to *Step 3*
3	Locate and repair open CKT 240 (ORN) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
4	1. Connect a test lamp between CKT 74 (LT BLU) wire at headlamp switch and ground. 2. Turn headlamp switch to PARK. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 5*
5	Replace headlamp switch. Did you complete the headlamp switch replacement?	—	System OK	—
6	1. Remove park fuse from IP fuse block. 2. Connect a test lamp between cavity A at IP fuse block and ground Does the test lamp light?	—	Go to *Step 8*	Go to *Step 7*
7	Locate and repair open CKT 74 (LT BLU) wire between headlamp switch and IP fuse block. Did you complete the wire repair?	—	System OK	—
8	1. Remove bolts from underhood bussed electrical center (UBEC) to gain access to the bottom of the UBEC. 2. Backprobe between CKT 74 (LT BLU) wire cavity A4 connector C1 and ground. Does the test lamp light?	—	Go to *Step 9*	Go to *Step 10*
9	Replace underhood bussed electrical center (UBEC). Did you complete the component replacement?	—	System OK	—
10	Locate and repair open CKT 74 (LT BLU) wire between IP fuse block and UBEC. Did you complete the wire repair?	—	System OK	—
11	1. Disconnect headlamp switch. 2. Connect a self-powered test lamp between CKT 240 (ORN) wire and ground. Does the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	1. Locate and repair short to ground in CKT 240 (ORN) wire. 2. Replace PARKLP fuse in the underhood bussed electrical center (UBEC). Did you complete the wire repair?	—	System OK	—
13	1. Remove Park fuse from IP fuse block. 2. Disconnect connector C1 from UBEC. 3. Connect a self-powered test lamp between CKT 74 (LT BLU) wire cavity A at headlamp switch and ground. Does the test lamp light?	—	Go to *Step 14*	Go to *Step 15*
14	Locate and repair short to ground in CKT 74 (LT BLU) wire. Did you complete the wire repair?		System OK	—
15	1. Reconnect UBEC C1 connector. 2. Remove fog lamp relay, RR PRK fuse, LR PRK fuse, TRL PK fuse, and FR PRK fuse. 3. Connect a self-powered test lamp between CKT 74 (LT BLU) wire cavity A at headlamp switch and ground. Does the test lamp light?	—	Go to *Step 16*	Go to *Step 17*

Step	Action	Value(s)	Yes	No
16	Replace underhood bussed electrical center (UBEC). Did you complete the component replacement?	—	System OK	—
17	Locate and repair intermittent short to ground in CKT 240 (ORN) wire or CKT 74 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—

Neither Of The Front Park Lamps Illuminate But The Rear Lights Work

Step	Action	Value(s)	Yes	No
1	Inspect FR PRK fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 3*	Go to *Step 2*
2	Locate and repair open CKT 2309 (BRN) wire at UBEC connector C4 cavity B5. Did you complete the wire repair?	—	System OK	—
3	1. Remove both park lamp bulbs. 2. Inspect bulbs for shorted filaments. Does either bulb have a shorted filament?	—	Go to *Step 4*	Go to *Step 5*
4	Replace defective bulb. Did you complete the bulb replacement?	—	System OK	—
5	Locate and repair short to ground in CKT 2309 (BRN) wire. Did you complete the wire repair?	—	System OK	—

None Of The Left Rear Lamps Operate, But The Front Park Lamps Work

Step	Action	Value(s)	Yes	No
1	Inspect LR PRK fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 5*	Go to *Step 2*
2	1. Disconnect SP401. 2. Connect a test lamp between CKT 2509 (BRN) wire cavity E and ground. 3. Turn headlamp switch to the PARK position. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Replace splice pack SP401. Did you complete the repair?	—	System OK	—
4	Locate and repair open CKT 2509 (BRN) wire. Did you complete the wire repair?	—	System OK	—
5	1. Disconnect SP401. 2. Connect a test lamp between CKT 2509 (BRN) wire cavity E and ground. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
6	Locate and repair short to ground in CKT 2509 (BRN) wire between UBEC and SP401. Did you complete the wire repair?	—	System OK	—
7	Connect a test lamp between CKT 2509 (BRN) wire cavity F at SP401 and ground. Does the test lamp light?	—	Go to *Step 8*	Go to *Step 9*
8	Locate and repair short to ground in CKT 2509 (BRN) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
9	Connect a test lamp between CKT 2509 (BRN) wire cavity G at SP401 and ground. Does the test lamp light?	—	Go to *Step 10*	Go to *Step 11*
10	Locate and repair short to ground in CKT 2509 (BRN) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
11	Connect a test lamp between CKT 2509 (BRN) wire cavity H at SP401 and ground. Does the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	Locate and repair short to ground in CKT 2509 (BRN) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
13	Locate and repair intermittent short to ground in CKT 2509 (BRN) wire. Did you complete the wire repair?	—	System OK	—

None Of The Right Rear Lamps Operate, But The Front Park Lamps Work

Step	Action	Value(s)	Yes	No
1	Inspect RR PRK fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 5*	Go to *Step 2*
2	1. Disconnect SP401. 2. Connect a test lamp between CKT 2609 (BRN/WHT) wire cavity J and ground. 3. Turn headlamp switch to the PARK position. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Replace splice pack SP401. Did you complete the repair?	—	System OK	—
4	Locate and repair open CKT 2609 (BRN/WHT) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
5	1. Disconnect SP401. 2. Connect a test lamp between CKT 2609 (BRN/WHT) wire cavity J and ground. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Locate and repair short to ground in CKT 2609 (BRN/WHT) wire between UBEC and SP401. Did you complete the wire repair?	—	System OK	—
7	Connect a test lamp between CKT 2609 (BRN/WHT) wire cavity K at SP401 and ground. Does the test lamp light?	—	Go to *Step 8*	Go to *Step 9*
8	Locate and repair short to ground in CKT 2609 (BRN/WHT) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
9	Connect a test lamp between CKT 2609 (BRN/WHT) wire cavity L at SP401 and ground. Does the test lamp light?	—	Go to *Step 10*	Go to *Step 11*
10	Locate and repair short to ground in CKT 2609 (BRN/WHT) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
11	Connect a test lamp between CKT 2609 (BRN/WHT) wire cavity M at SP401 and ground. Does the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	Locate and repair short to ground in CKT 2609 (BRN/WHT) wire. NOTE: be sure to inspect the bulb for a shorted filament. Did you complete the wire repair?	—	System OK	—
13	Locate and repair intermittent short to ground in CKT 2609 (BRN/WHT) wire. Did you complete the wire repair?	—	System OK	—

One Of The Exterior Lamps Is Inoperative

Step	Action	Value(s)	Yes	No
1	1. Note: Repeat this test as necessary for each inoperative bulb. 2. Disconnect the inoperative bulb. 3. Inspect the bulb. Is the bulb open?	—	Go to *Step 2*	Go to *Step 3*
2	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
3	1. Connect a test lamp between CKT 2X09 (BRN or BRN/WHT) wire at lamp socket and ground. 2. Turn headlamp switch to PARK. Did the test lamp light?	—	Go to *Step 5*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
4	Locate and repair open CKT 2X09 (BRN or BRN/WHT) wire. Did you complete the wire repair?	—	System OK	—
5	Connect a self-powered test lamp between CKT XX50 (BLK) wire at lamp socket and ground. Did the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
7	Locate and repair open CKT XX50 (BLK) wire. Did you complete the wire repair?	—	System OK	—

Hazard Flashers/Turn Signals Turn On But Do Not Flash

Step	Action	Value(s)	Yes	No
1	Replace hazard lamps flasher. Did you complete the hazard flasher replacement?	—	System OK	—

None Of The Turn Signals Operate

Step	Action	Value(s)	Yes	No
1	Inspect fuse 10. Is fuse 10 open?	—	Go to *Step 15*	Go to *Step 2*
2	1. Disconnect turn signal/hazard flasher. 2. Connect a test lamp between CKT 1508 (LT BLU) wire cavity A1 and ground. 3. Turn ignition switch to the run position. Does the test lamp light?	—	Go to *Step 8*	Go to *Step 3*
3	Backprobe a test lamp between CKT 139 (PNK) wire cavity A2 and ground. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT 139 (PNK) wire. Did you complete the wire repair?	—	System OK	—
5	Backprobe a test lamp between CKT 1508 (LT BLU) wire cavity A3 at C211 and ground. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Locate and repair open CKT 1508 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—
7	Replace turn signal switch. Did you complete the turn signal switch replacement?	—	System OK	—
8	Connect a test lamp between CKT 1508 (LT BLU) wire cavity A1 and CKT 1050 (BLK) wire cavity B2. Does the test lamp light?	—	Go to *Step 10*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Locate and repair open CKT 1050 (BLK) wire. Did you complete the wire repair?	—	System OK	—
10	1. Connect a test lamp between CKT 1508 (LT BLU) wire cavity A1 and CKT 1697 (PPL) wire cavity C1. 2. Turn on hazard flashers. Does the test lamp light?	—	Go to *Step 11*	Go to *Step 12*
11	Replace turn signal/hazard flasher. Did you complete the component replacement?	—	System OK	—
12	1. Disconnect C211. 2. Connect a digital multimeter between CKT 1697 (PPL) wire cavity C1 at turn signal/hazard flasher and CKT 1697 (PPL) wire cavity A5 at C211. Is the resistance within the specified value?	.05 Ω	Go to *Step 14*	Go to *Step 13*
13	Locate and repair open CKT 1697 (PPL) wire. Did you complete the wire repair?	—	System OK	—
14	Replace turn signal switch. Did you complete the turn signal switch replacement?	—	System OK	—
15	1. Disconnect C211. 2. Replace fuse 10. 3. Turn ignition switch to the run position. Did the fuse open?	—	Go to *Step 16*	Go to *Step 17*
16	Jumper A2 to A3, A5, E6, E7, A6, and A7 one at a time. Did any circuit cause fuse 10 to open?	—	Go to *Step 17*	Go to *Step 18*
17	Locate and repair short to ground in the circuit that caused the fuse to open. Did you complete the wire repair?	—	System OK	—
18	1. Turn ignition to the off position. 2. Reconnect C211. 3. Turn ignition switch to the run position. 4. Operate turn signal lever to all positions. Did fuse 10 open?	—	Go to *Step 19*	Go to *Step 20*
19	Replace turn signal switch. Did you complete the turn signal switch replacement?	—	System OK	—
20	Locate and repair intermittent short to ground in turn signal switch circuitry. Did you complete the wire repair?	—	System OK	—

One Of The Turn Signals Does Not Operate

Step	Action	Value(s)	Yes	No
1	1. Note: Repeat this test as necessary for each inoperative bulb. 2. Disconnect the inoperative bulb. 3. Inspect the bulb. Is the bulb open?	—	Go to *Step 2*	Go to *Step 3*
2	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
3	Connect a self-powered test lamp between CKT XX50 (BLK) wire at lamp socket. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT XX50 (BLK) wire. Did you complete the wire repair?	—	System OK	—
5	1. Connect a test lamp between cavity A at lamp socket and ground. 2. Turn ignition switch to RUN and select the appropriate direction on the turn signal switch. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
7	Locate and repair open in lamp feed circuit. Did you complete the wire repair?	—	System OK	—

Brake Lamps Do Not Operate

Step	Action	Value(s)	Yes	No
1	Inspect STOP LP fuse. Is STOP LP fuse open?	—	Go to *Step 19*	Go to *Step 2*
2	Does the high mounted stop lamp (CHMSL) illuminate when the brakes are applied?	—	Go to *Step 8*	Go to *Step 3*
3	1. Disconnect stop lamps switch. 2. Connect a test lamp between CKT 1540 (ORN) wire and ground. Does the test lamp light?	—	Go to *Step 5*	Go to *.Step 4*
4	Locate and repair open CKT 1540 (ORN) wire. Did you complete the wire repair?	—	System OK	—
5	1. Remove CHMSL relay. 2. Connect a jumper between CKT 1540 (ORN) wire and CKT 17 (WHT) wire at stop lamps switch. 3. Connect a test lamp between CHMSL relay cavity 5 and ground. Did the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Adjust or replace stoplamps switch. Did you complete the stoplamps switch repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
7	Locate and repair open CKT 17 (WHT). Did you complete the wire repair?	—	System OK	—
8	1. Remove CHMSL relay. 2. Connect a test lamp between CHMSL relay cavity 5 and ground. 3. Apply service brakes. Does the test lamp light?	—	Go to *Step 10*	Go to *Step 9*
9	Replace underhood bussed electrical center (UBEC). Did you complete the UBEC replacement?	—	System OK	—
10	Connect a test lamp between cavity 5 and cavity 3 at CHMSL relay. Does the test lamp light?	—	Go to *Step 12*	Go to *Step 11*
11	Locate and repair open CKT 350 (BLK) wire. Did you complete the wire repair?	—	System OK	—
12	Connect a test lamp between cavity 2 and 3 at CHMSL relay. Does the test lamp light?	—	Go to *Step 14*	Go to *Step 13*
13	Replace underhood bussed electrical center (UBEC). Did you complete the UBEC replacement?	—	System OK	—
14	Connect a jumper between cavity 1 and 2 at CHMSL relay. Do the brake lights illuminate?	—	Go to *Step 15*	Go to *Step 16*
15	Replace high mounted stop lamp (CHMSL) relay. Did you complete the component replacement?	—	System OK	—
16	Backprobe a test lamp between CKT 895 (YEL) wire cavity A10 at C211 and ground. Does the test lamp light?	—	Go to *Step 18*	Go to *Step 17*
17	Locate and repair open CKT 895 (YEL) wire. Did you complete the wire repair?	—	System OK	—
18	Replace turn signal switch. Did you complete the turn signal switch replacment?	—	System OK	—
19	Connect a test lamp between B+ and STOP LP fuse cavity B. Does the test lamp light?	—	Go to *Step 20*	Go to *Step 21*
20	Locate and repair short to ground in CKT 1540 (ORN) wire. Did you complete the wire repair?	—	System OK	—
21	Apply the service brake. Does the test lamp light?	—	Go to *Step 22*	Go to *Step 23*
22	Locate and repair short to ground in CKT 17 (WHT) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
23	1. Remove CHMSL relay. Connect a test lamp between B+ and cavity 1 at CHMSL relay. Does the test lamp light?	—	Go to *Step 24*	Go to *Step 25*
24	Locate and repair short to ground in CKT 895 (YEL) wire. Did you complete the wire repair?	—	System OK	—
25	1. Disconnect C211. 2. Reinstall CHMSL relay and replace STOP LP fuse. 3. Connect a jumper between CKT 895 (YEL) wire cavity A10 at C211 and CKT 1419 (DK GRN/WHT) wire cavity E6 at C211. 4. Apply service brakes. Does the STOP LP fuse open?	—	Go to *Step 26*	Go to *Step 27*
26	Locate and repair short to ground in CKT 1419 (DK GRN/WHT) wire. Did you complete the wire repair?	—	System OK	—
27	1. Connect a jumper between CKT 895 (YEL) wire cavity A10 at C211 and CKT 1419 (DK GRN/WHT) wire cavity E6 at C211. 2. Apply service brakes. Does the STOP LP fuse open?	—	Go to *Step 28*	Go to *Step 29*
28	Locate and repair short to ground in CKT 1418 (YEL/BLK) wire. Did you complete the wire repair?	—	System OK	—
29	1. Reconnect C211. 2. Apply service brakes. Does the STOP LP fuse open?	—	Go to *Step 30*	Go to *Step 31*
30	Replace turn signal switch. Did you complete the component replacement?	—	System OK	—
31	Is the turn fuse 10 in the IP fuse block and/or the HAZ LP fuse in the UBEC open?	—	Go to *Step 32*	Go to *Step 33*
32	Locate and repair intermittent short to ground in CKTs 1419(DK GRN/WHT) or 1418(YEL/BLK). Did you complete the wire repair?	—	System OK	—
33	Locate and repair intermittent short to ground in stop lamp switch circuitry. Did you complete the wire repair?	—	System OK	—

CHMSL Does Not Operate

Step	Action	Value(s)	Yes	No
1	Inspect VEH CHMSL fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 2*	Go to *Step 3*
2	Locate and repair short to ground in CKT 1320 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
3	1. Disconnect high mounted stop lamp (CHMSL). 2. Connect a test lamp between CKT 1320 (LT BLU) wire and ground. 3. Apply the service brakes. Does the test lamp light?	—	Go to *Step* *5*	Go to *Step* *4*
4	Locate and repair open CKT 1320 (LT BLU) wire. Did you complete the wire repair?	—	System OK	—
5	1. Connect a test lamp between CKT 1320 (LT BLU) wire and CKT 1850 (BLK) wire at CHMSL connector. 3. Apply the service brake. Does the test lamp light?	—	Go to *Step* *6*	Go to *Step* *7*
6	1. Inspect the bulbs in the CHMSL. 2. If the bulbs are open, replace them, otherwise, replace the CHMSL. Did you complete the repair?	—	System OK	—
7	Locate and repair open in CKT 1850 (BLK) wire. Did you complete the wire repair?	—	System OK	—

One Of The Brake Lights Does Not Operate

Step	Action	Value(s)	Yes	No
1	1. Disconnect the inoperative bulb. 2. Inspect the bulb. Is the bulb open?	—	Go to *Step* *2*	Go to *Step* *3*
2	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
3	Connect a self-powered test lamp between CKT 1750 (BLK) wire (LH side) or CKT 2250 (BLK) wire (RH side) cavity G at lamp socket and ground. Does the test lamp light?	—	Go to *Step* *5*	Go to *Step* *4*
4	Locate and repair open CKT XX50 (BLK) wire. Did you complete the wire repair?	—	System OK	—
5	1. Connect a test lamp between CKT 618 (YEL) wire (LH side) or CKT 619 (DK GRN) wire (RH side) cavity A at lamp socket and ground. 2. Apply the service brakes. Does the test lamp light?	—	Go to *Step* *6*	Go to *Step* *7*
6	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
7	Locate and repair open in brake lamp feed wire. Did you complete the wire repair?	—	System OK	—

Turn Signal Indicators On Dash Do Not Flash

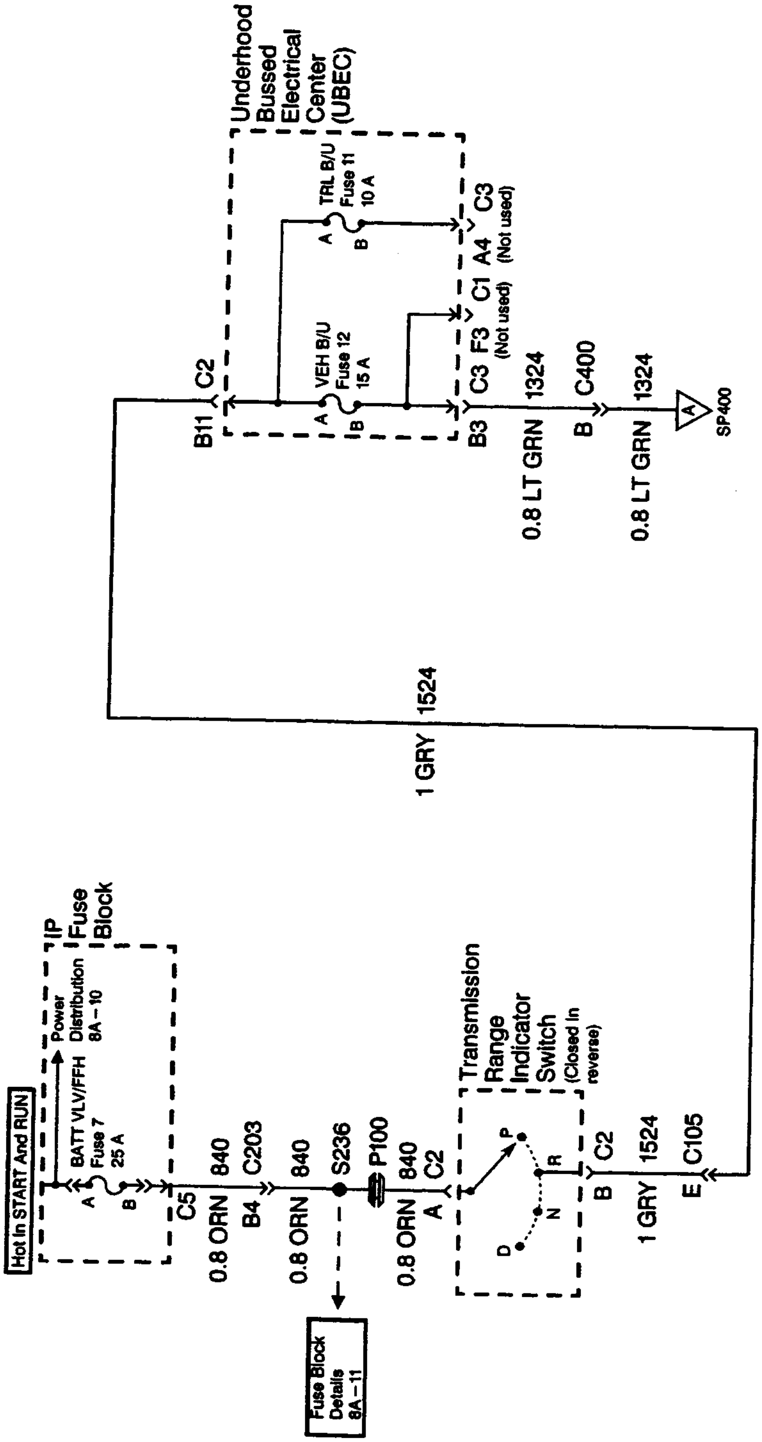
Step	Action	Value(s)	Yes	No
1	Are both indicator bulbs inoperative?	—	Go to *Step 7*	Go to *Step 2*
2	Is the left indicator bulb inoperative?	—	Go to *Step 5*	Go to *Step 3*
3	1. Remove the right indicator bulb. 2. Inspect the bulb and socket. Is the bulb open or the socket damaged?	—	Go to *Step 4*	Go to *Step 11*
4	Replace bulb and/or socket. Did you complete the repair?	—	System OK	—
5	1. Remove the left indicator bulb. 2. Inspect the bulb and socket. Is the open or the socket damaged?	—	Go to *Step 6*	Go to *Step 14*
6	Replace bulb and/or socket. Did you complete the repair?	—	System OK	—
7	1. Remove both indicator bulbs. 2. Inspect the bulbs and sockets. Are the bulbs open or the sockets damaged?	—	Go to *Step 10*	Go to *Step 11*
8	Replace the bulbs and/or the sockets. Did you complete the repair?	—	System OK	—
9	Connect a self-powered test lamp between CKT 1050 (BLK) wire cavity B3 at instrument cluster. Does the test lamp light?	—	Go to *Step 13*	Go to *Step 12*
10	Locate and repair open CKT 1050 (BLK) wire. Did you complete the wire repair?	—	System OK	—
11	1. Connect a test lamp between CKT 1415 (DK BLU/WHT) wire cavity B11 at instrument cluster and ground. 2. Turn ignition switch to RUN. 3. Select right turn signal. Does the test lamp light?	—	Go to *Step 12*	Go to *Step 13*
12	Replace instrument cluster. Did you complete the instrument cluster replacement?	—	System OK	—
13	Locate and repair open CKT 1415 (DK BLU/WHT) wire. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
14	1. Connect a test lamp between CKT 1414 (LT BLU/WHT) wire cavity B1 at instrument cluster and ground. 2. Turn ignition switch to RUN. 3. Select left turn signal. Does the test lamp light?	—	Go to *Step 15*	Go to *Step 16*
15	Replace instrument cluster. Did you complete the instrument cluster replacement?	—	System OK	—
16	Locate and repair open CKT 1414 (LT BLU/WHT) wire. Did you complete the wire repair?	—	System OK	—

CIRCUIT OPERATION

Voltage for the turn signal lamps is provided by fuse 10 in the IP fuse block. Voltage for the hazard lamps is provided by the HAZ LP fuse in the underhood bussed electrical center (UBEC). Voltage to the brake lights is provided through the STOP LP fuse and the CHMSL relay. The HAZ LP fuse is HOT AT ALL TIMES so the hazard lamps will work at all times. The TURN fuse 10 is HOT IN START OR RUN. STOP LP fuse is HOT AT ALL TIMES and provides power to the switched side of the CHMSL relay and the coil side through the stop lamps switch. The turn signal/hazard flasher is powered by either the HAZ LP fuse or the TURN fuse depending on the position of the hazard switch. When the turn signal or hazard flasher switch is engaged, the current flow to the turn signal bulbs causes the hazard turn signal relay to open and close and flash the bulbs. The Park lamps and tail lamps are powered through PARKLP fuse in the underhood bussed electrical center (UBEC), which is hot at all times, and the headlamp switch.

BACKUP LIGHTS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A
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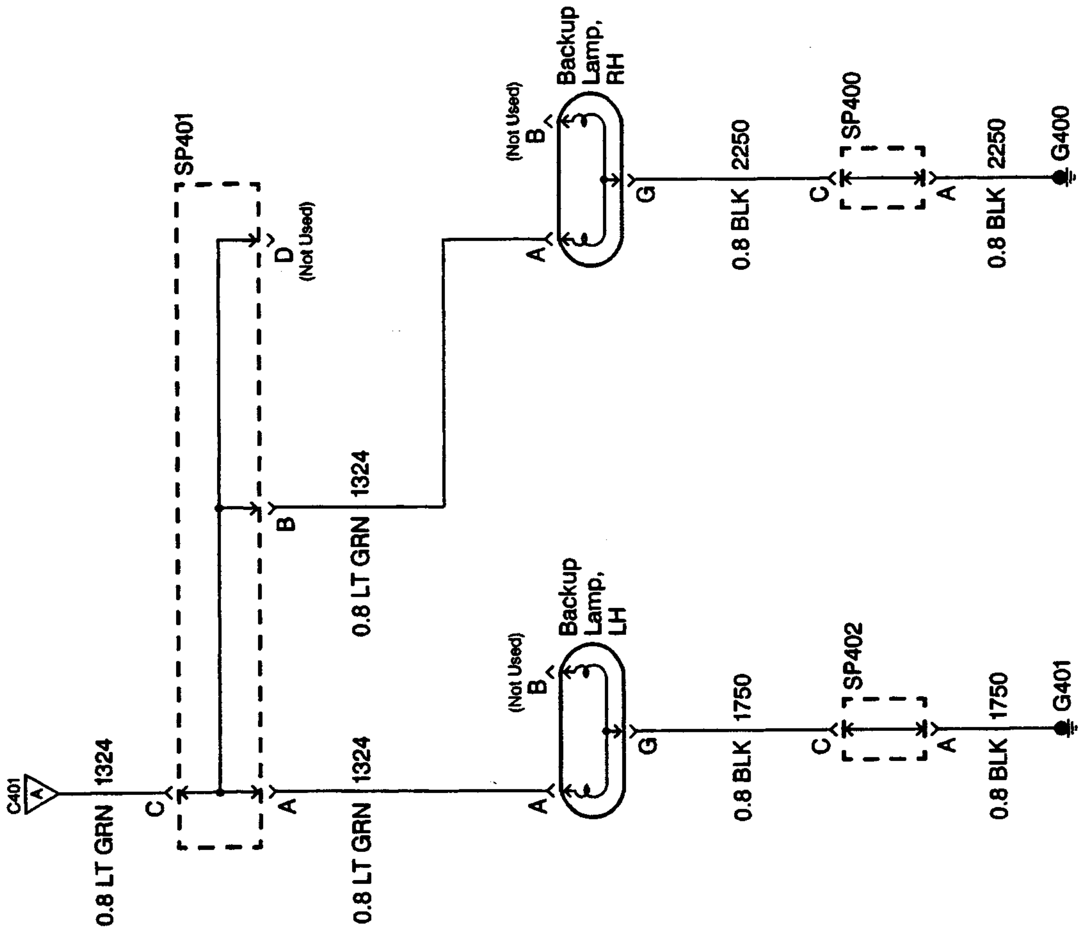
Power Distribution 8A–10
IP Fuse Block
C5
0.8 ORN
840
B4
C203
0.8 ORN
840
S236
P100
0.8 ORN
840
A
C2
Fuse Block Details 8A–11
Transmission Range Indicator Switch
(Closed in reverse)
P
R
N
D
B
C2
1 GRY
1524
E
C105
1 GRY
1524
B11
C2
Underhood Bussed Electrical Center (UBEC)
VEH B/U
Fuse 12
15 A
A
B
TRL B/U
Fuse 11
10 A
A
B
B3
C3
F3
C1
(Not used)
A4
C3
(Not used)
0.8 LT GRN
1324
B
C400
0.8 LT GRN
1324
A
SP400


C401
A
0.8 LT GRN 1324
C
SP401
D
(Not Used)
B
0.8 LT GRN 1324
A
0.8 LT GRN 1324
(Not Used)
B
Backup Lamp, RH
A
G
0.8 BLK 2250
SP400
C
A
0.8 BLK 2250
G400
(Not Used)
B
Backup Lamp, LH
A
G
0.8 BLK 1750
SP402
C
A
0.8 BLK 1750
G401

BACKUP LIGHTS

Backup Lighting Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0

Backup Lighting Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Backup Lamp, LH	Left rear corner of vehicle	52	53	24
Backup Lamp, RH	Right rear corner of vehicle	52	53	24
IP Fuse Block	LH side of instrument panel	33	34	76
Transmission Range Indicator Switch C2	Below drive motor, on left side, near axle	23	24	31
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C3	At UBEC	53	54	72
C105	Front body harness to propulsion harness, near P/B booster	12	13	100
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C400	Tail and stoplamps harness to chassis harness, under vehicle, at left rear of frame	66	67	95
G400	Right rear of vehicle on frame			
G401	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S236				
SP400	Mounted to left rear frame rail	52	53	
SP401	Mounted to left rear frame rail	66	67	
SP402	Mounted to right rear frame rail	66	67	

Backup Lighting Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Turn ignition switch to RUN without starting engine. Set parking brake. Place gear shift lever in reverse.	Both backup lamps illuminate	• *Neither backup lamp illuminates.* • *Only the left or right backup lamp illuminate.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

Neither Backup Lamp Illuminates

Step	Action	Value(s)	Yes	No
1	Inspect fuse 7 in the IP fuse block. Is the fuse open?	—	Go to *Step 12*	Go to *Step 2*
2	1. Turn ignition switch to the RUN position. 2. Connect a test lamp between CKT 840 (ORG) wire and ground at backup lamps switch Does the test lamp light?	—	Go to *Step 4*	Go to *Step 3*
3	Locate and repair open in CKT 840 (ORG) wire. Did you complete the wire repair?	—	System OK	—
4	1. Connect test lamp between CKT 1524 (GRY) wire at backup lamps switch. 2. Place transmission in reverse. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 5*
5	Adjust or replace backup lamps switch. Did you complete the repair?	—	System OK	—
6	With fuse installed, connect a test lamp between each terminal on the back of the VEH B/U fuse in the underhood bussed electrical center (UBEC) and ground. Did the test lamp light at either terminal?	—	Go to *Step 8*	Go to *Step 7*
7	Locate and repair open CKT 1524 (GRY) wire. Did you complete the wire repair?	—	System OK	—
8	Did the test lamp light at both terminals?	—	Go to *Step 9*	Go to *Step 17*
9	Connect a test lamp between CKT 1324 (LT GRN) wire cavity B at SP400. Does the test lamp light?	—	Go to *Step 11*	Go to *Step 10*
10	Locate and repair open CKT 1324 (LT GRN) wire. Did you complete the wire repair?	—	System OK	—
11	Locate and repair open in SP400. Did you complete the repair?	—	System OK	—
12	Connect a test lamp between cavity A and B at fuse 7. Does the test lamp light?	—	Go to *Step 13*	Go to *Step 14*
13	Locate and repair short to ground in CKT 840 (ORG) wire. Did you complete the wire repair?	—	System OK	—
14	Place transmission in reverse. Does the test lamp light?	—	Go to *Step 15*	Go to *Step 16*
15	Locate and repair short to ground in CKT 1524 (GRY) wire. Did you complete the wire repair?	—	System OK	—

BACKUP LIGHTS

Step	Action	Value(s)	Yes	No
16	Locate and repair intermittent short to ground in backup lamps wiring. Did you complete the wire repair?	—	System OK	—
17	Locate and repair short to ground in CKT 1324 (LT GRN) wire. Note: Be sure to check backup lamp bulbs for shorted filament which could cause a short to ground. Did you complete the wire repair?	—	System OK	—

Only The Left Or Right Backup Lamp Illuminates

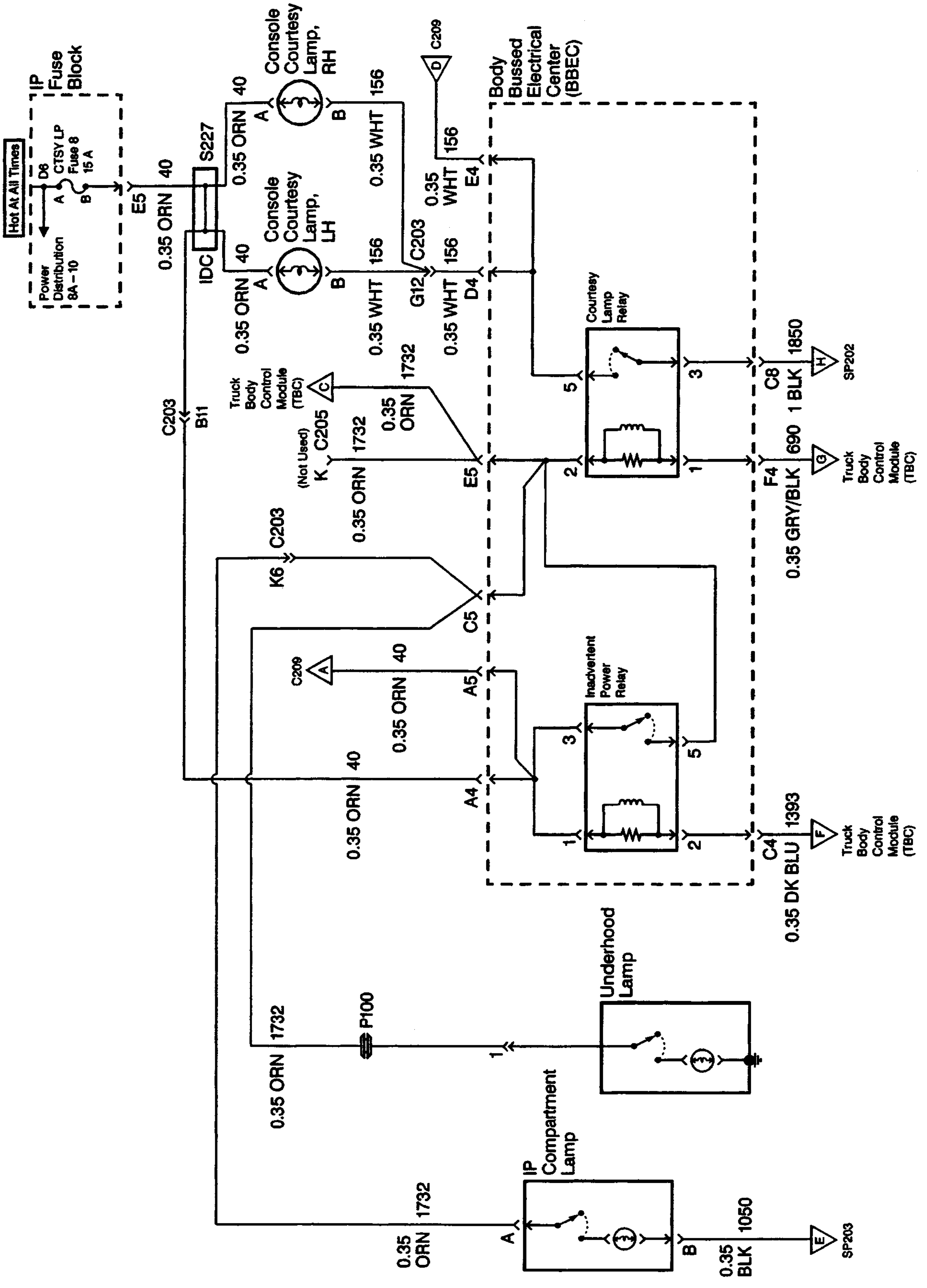
Step	Action	Value(s)	Yes	No
1	1. Remove inoperative bulb. 2. Inspect bulb. Is the bulb open?	—	Go to *Step 2*	Go to *Step 3*
2	Replace bulb. Did you complete the bulb replacement?	—	System OK	—
3	1. Connect a test lamp between CKT 1324 (LT GRN) wire at lamp socket and ground. 2. Turn ignition switch to the RUN position. 3. Place transmission in reverse. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT 1324 (LT GRN) wire. Did you complete the wire repair?	—	System OK	—
5	Connect a test lamp between CKT 1324 (LT GRN) and CKT 1750 (BLK) wire at lamp socket. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	1. Inspect lamp socket for damaged or corroded terminals. 2. Repair or replace lamp socket as needed. 3. If lamp socket is OK, replace bulb. Did you complete the repair?	—	System OK	—
7	Locate and repair open in CKT 1750 (BLK) wire. Did you complete the wire repair?	—	System OK	—

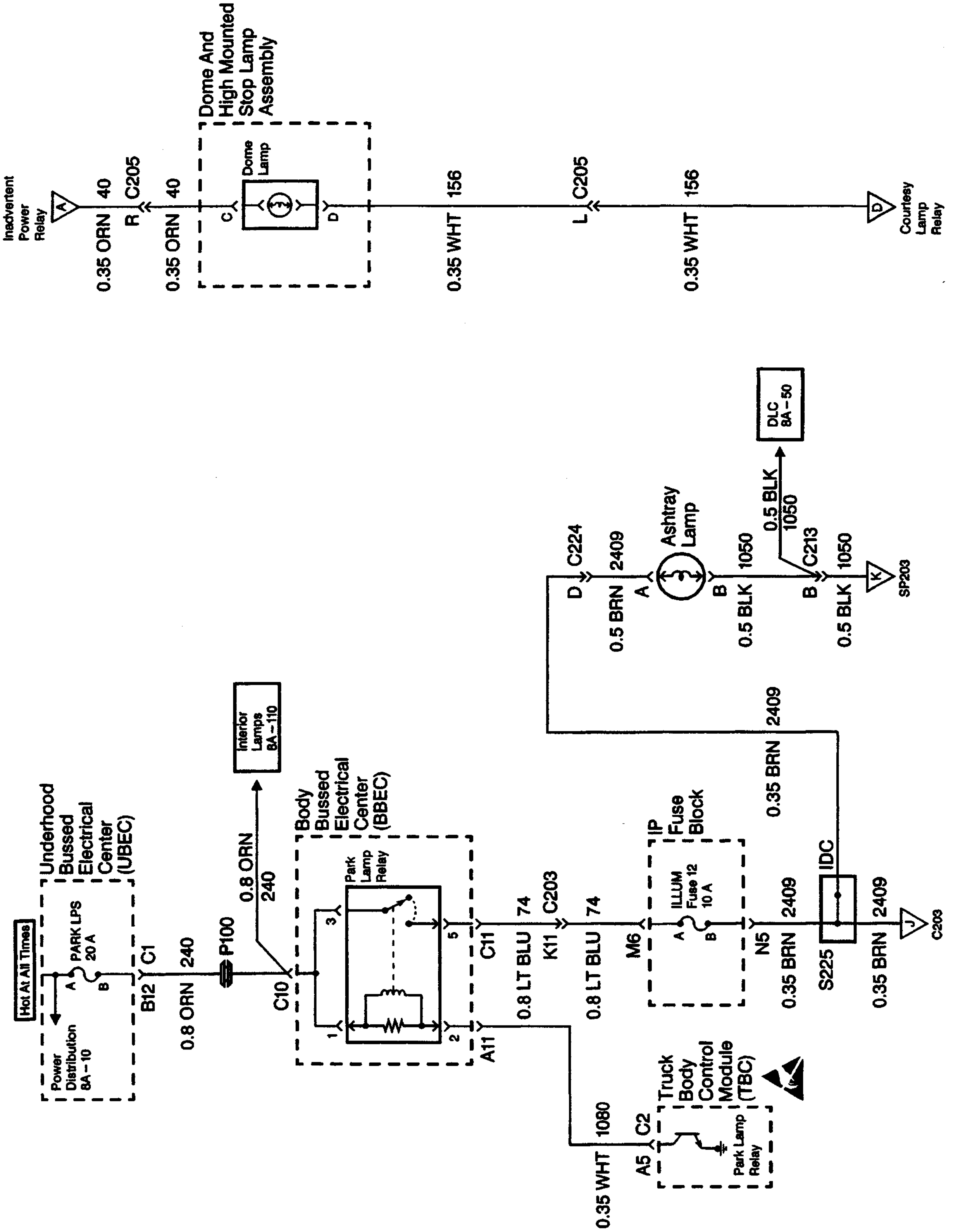
CIRCUIT OPERATION

Voltage is supplied to the backup lamps when the ignition is in RUN and the backup lamps switch is closed. There are two fuses in the circuit. B/U LP fuse in the underhood bussed electrical center (UBEC) protects the circuit between the B/U LP fuse and the VEH B/U fuse.. VEH B/U fuse protects the circuit between the UBEC and the backup lamps

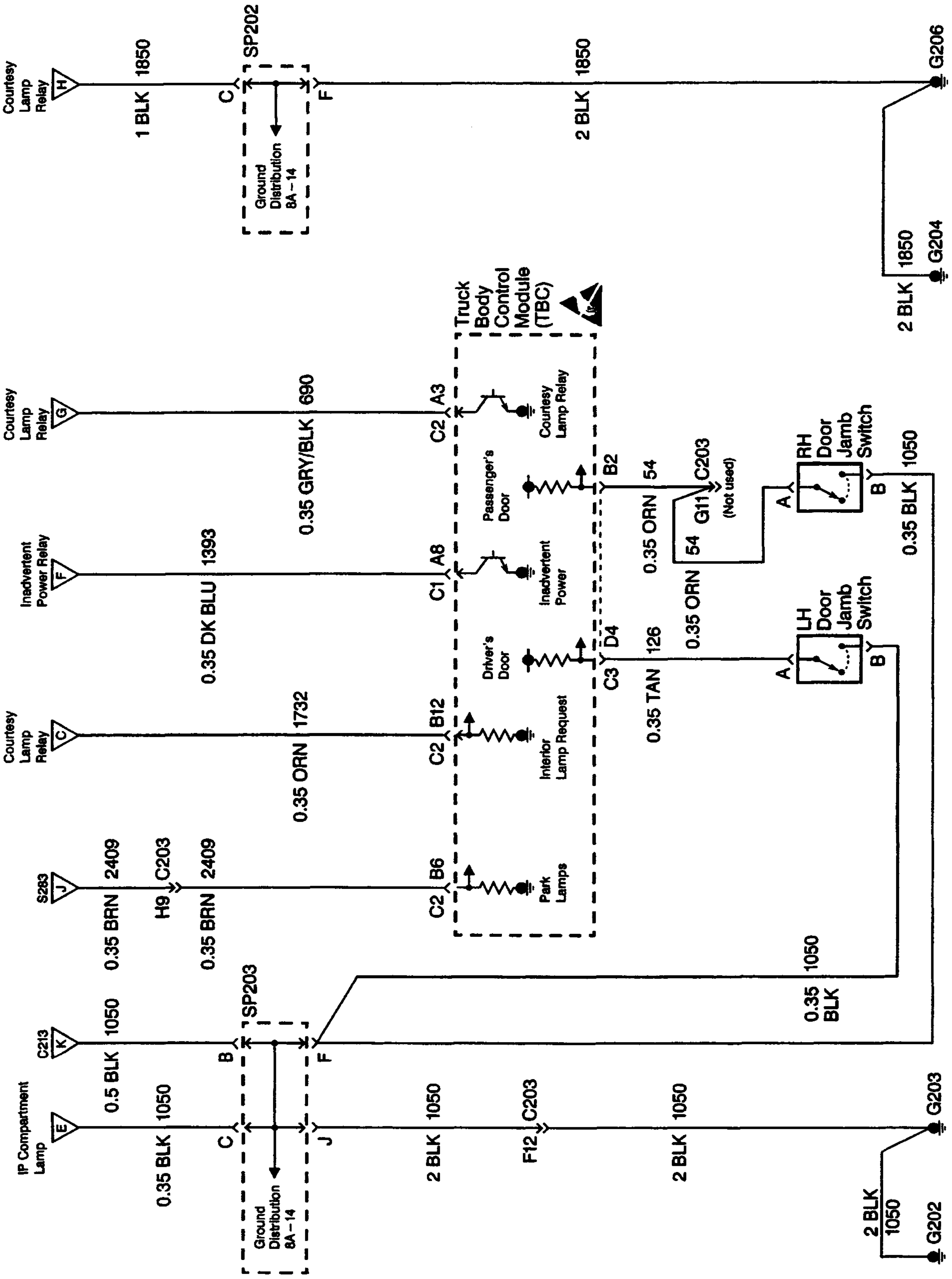
BLANK

INTERIOR LIGHTS


IP Fuse Block
Hot At All Times
D6
A
CTSY LP Fuse 8 15 A
B
Power Distribution 8A-10
E5
40
0.35 ORN
S227
IDC
C203
B11
Console Courtesy Lamp, RH
Console Courtesy Lamp, LH
A
B
156
0.35 WHT
G12
C203
C209
D
Body Bussed Electrical Center (BBEC)
E4
D4
Courtesy Lamp Relay
5
3
2
1
C8
1850
1 BLK
H
SP202
Truck Body Control Module (TBC)
C
1732
0.35 ORN
(Not Used)
K
C205
E5
F4
690
0.35 GRY/BLK
G
K6
C5
C209
A
A5
Inadvertent Power Relay
A4
C4
1393
0.35 DK BLU
F
Underhood Lamp
P100
IP Compartment Lamp
1050
0.35 BLK
E
SP203


Inadvertent Power Relay
A
0.35 ORN 40
R C205
0.35 ORN 40
Dome And High Mounted Stop Lamp Assembly
Dome Lamp
C
D
0.35 WHT 156
L C205
0.35 WHT 156
D
Courtesy Lamp Relay
Hot At All Times
Underhood Bussed Electrical Center (UBEC)
Power Distribution 8A-10
PARK LPS 20 A
A
B
B12 C1
0.8 ORN 240
P100
0.8 ORN 240
Interior Lamps 8A-110
Body Bussed Electrical Center (BBEC)
C10
Park Lamp Relay
3
1
5
2
C11
A11
0.8 LT BLU 74
K11 C203
0.8 LT BLU 74
M6
IP Fuse Block
ILLUM Fuse 12 10 A
A
B
N5
0.35 BRN 2409
S225
IDC
0.35 BRN 2409
J
C203
0.35 BRN 2409
D C224
0.5 BRN 2409
A
Ashtray Lamp
B
0.5 BLK 1050
B C213
0.5 BLK 1050
K
SP203
0.5 BLK 1050
DLC 8A-50
Truck Body Control Module (TBC)
Park Lamp Relay
A5 C2
0.35 WHT 1080

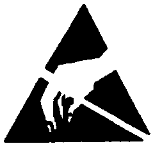
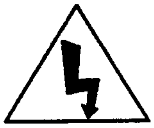
INTERIOR LIGHTS


Courtesy Lamp Relay
H
1 BLK
1850
C
SP202
Ground Distribution 8A - 14
F
2 BLK
1850
G206
2 BLK
1850
G204
Truck Body Control Module (TBC)
Courtesy Lamp Relay
G
0.35 GRY/BLK
690
C2
A3
Courtesy Lamp Relay
Passenger's Door
B2
54
C203
G11
(Not used)
0.35 ORN
54
RH Door Jamb Switch
A
B
0.35 BLK
1050
Inadvertent Power Relay
F
0.35 DK BLU
1393
C1
A8
Inadvertent Power
Driver's Door
D4
C3
126
0.35 ORN
0.35 TAN
LH Door Jamb Switch
A
B
Courtesy Lamp Relay
C
0.35 ORN
1732
C2
B12
Interior Lamp Request
S283
J
0.35 BRN
2409
H9
C203
0.35 BRN
2409
C2
B6
Park Lamps
1050
0.35 BLK
C213
K
0.5 BLK
1050
B
SP203
F
IP Compartment Lamp
E
0.35 BLK
1050
C
Ground Distribution 8A - 14
J
2 BLK
1050
F12
C203
2 BLK
1050
G203
2 BLK
1050
G202

Interior Lighting Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Ground Distribution: 8A-14	8A-14-0
Data Link Connector: 8A-50	8A-50-0
Exterior Lamps: 8A-110	8A-110-0

Interior Lighting Schematic Icon Table

Icon	Icon Definition
	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
	**This icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information*.**

Interior Lighting Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Ashtray Lamp	Above ashtray	44	45	1
Body Bussed Electrical Center	Behind center of IP			78
Courtesy Lamp Relay	In the body bussed electrical center (BBEC)			
Courtesy Lamp, LH	Below LH side of IP			4
Courtesy Lamp, RH	Below LH side of IP	41	42	5
Dome Lamp and High Mounted Stop Lamp	Rear center of cab	50	51	34
Door Jamb Switch, LH	In LH side of IP			26
Door Jamb Switch, RH	In RH side of IP	38	39	27
Inadvertent Power Relay	In the body bussed electrical center (BBEC)			
IP Compartment Lamp	Inside IP compartment	43	44	12
IP Fuse Block	LH side of instrument panel	33	34	76
Park Lamp Relay	In body bussed electrical center (BBEC)			

INTERIOR LIGHTS

Name	Location	201-Pg	Fig.	Conn.
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Lamp	Under hood, left side, near bottom of hood	10	11	
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C205	Dome lamp harness to Front body harness, behind LH side of IP beneath IP speaker	50	51	102
C213	Propulsion harness to IP harness,			90
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
G204	On power steering pump bracket	63	64	
G206	Left rear of vehicle on frame			
P100	Below brake master cylinder at bulkhead	25	26	
S227	In I/P harness run channel 4 cm from courtesy lamp body harness inline connector breakout	41	42	
SP202	Behind IP cluster			
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			

DIAGNOSIS—INTERIOR LAMPS

TROUBLESHOOTING HINTS:

1. CHECK the condition of the GAUGES Fuse 4, CTSY Fuse 8, and PARK LPS Fuse 12. If any fuse(s) is open, LOCATE and REPAIR source of overload. REPLACE fuse(s).
2. CHECK that Grounds G200, G201, G202, G203, G420 and G450 are clean and tight.
3. CHECK for open filaments in inoperative lamps. If IP Compartment Box Lamp remains ON with the switch OFF, REPLACE the IP Compartment Box Lamp. If Underhood Reel Lamp remains On with the switch OFF, REPLACE the Underhood Reel Lamp
4. CHECK for a broken (or partially broken) wire inside of the insulation which could cause system malfunction but prove GOOD in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring for a voltage drop with the system operational (under load).
5. CHECK for proper installation of aftermarket electronic equipment which may affect the integrity of other systems. See Troubleshooting Procedures.

COURTESY/ DOME LAMP(S) REMAIN ON

TEST	RESULT	ACTION
1. Connect a test lamp from CKT 40 (ORN) wire at inoperative courtesy or dome lamp to ground.	Test lamp lights.	GO to step 2.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 40 (ORN) wire between the Console Courtesy Lamp(s) and IP Fuse Block.
2. Open both doors and turn instrument Panel Dimmer Switch to ON. Connect a test lamp from CKT 40 (ORN) wire to CKT 156 (WHT) wire at inoperative courtesy or dome lamp.	Test lamp lights.	REPLACE bulb if lamp did not work. If lamp stayed ON all the time, GO to step 3.
	Test lamp does not light.	GO to step 3.
3. Disconnect all side Door Jamb Switches. Connect an digital multimeter from cavity A and B of the inoperative Side Door Jamb Switch . Take reading with door open and reading with door closed. With door open, reading must be 0 ohms and with door closed, infinite ohms.	Correct readings.	GO to step 4.
	Incorrect readings.	REPLACE the Door Jamb Switch(es) that have incorrect reading.
4. Disconnect Dimmer Switch. Connect digital multimeter from CKT 1495 (DK BLU/WHT) cavity G and cavity K CKT 44 (DK GRN) at Panel Dimmer Switch. Turn Panel Dimmer Switch to ON and then OFF and take reading in each position. When ON, reading must be 0 ohms and when OFF, reading must be infinite ohms.	Correct readings.	LOCATE and REPAIR open or short in CKT 1495 (DK BLU/WHT) between the Headlamp Switch and Truck Body Control Modules or CKT 44 (DK GRN) wire between the IP Fuse Block and the Headlamp Switch.
	Incorrect readings.	REPLACE Panel Dimmer Switch.

IP COMPARTMENT BOX LAMP INOPERATIVE

TEST	RESULT	ACTION
1. Open IP compartment door. Connect a test lamp from CKT 1732 (ORN) wire at IP Compartment Lamp to ground.	Test lamp lights.	GO to step 2.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 1732 (ORN) wire between the IP compartment Lamp cavity A and BBEC cavity C5.
2. Connect a test lamp CKT 1050 (BLK) wire between the IP Compartment Lamp cavity B and Ground G203.	Test lamp lights.	REPLACE bulb.
	Test lamp does not light.	Check for an open in CKT 1050 (BLK) wire between IP Compartment Lamp and G203. If OK, REPLACE IP Compartment Lamp assembly.

UNDERHOOD LAMP INOPERATIVE

TEST	RESULT	ACTION
1. Connect a test lamp from CKT 1732 (ORN) wire at Underhood Lamp to ground.	Test lamp lights.	REPLACE Lamp bulb.
	Test lamp does not light.	LOCATE and REPAIR open in CKT 1732 (ORN) wire between IP Compartment Lamp and BBEC.

ASHTRAY LAMP IS INOPERATIVE

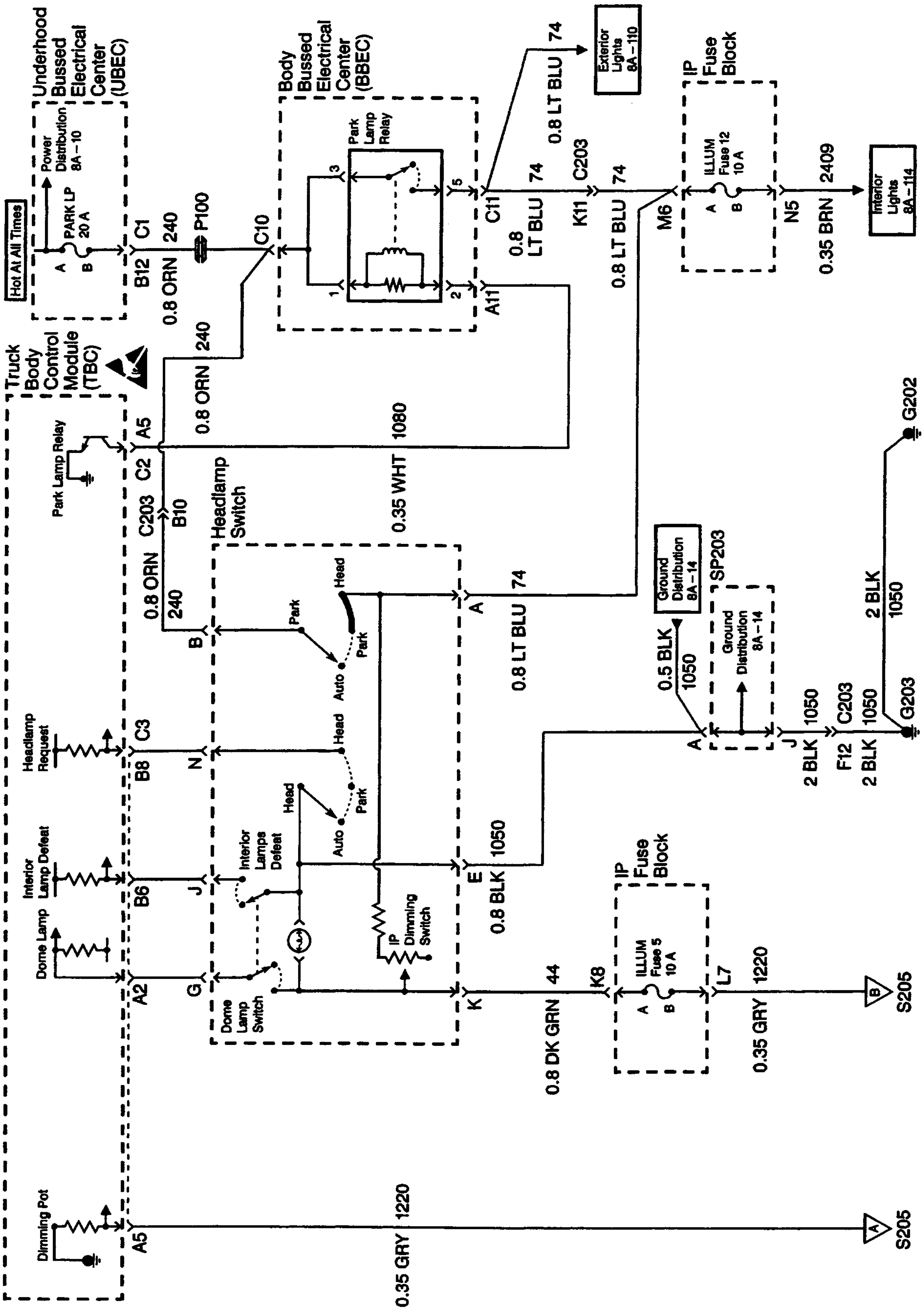
TEST	RESULT	ACTION
1. Place the Headlamp Switch in the Park Lamps position. Remove the bulb from the Ashtray Lamp connector. Connect a test lamp between connector C224 Cavity D for the CKT 2409 (BRN) wire and ground.	Test lamp lights	GO to step 2.
	Test lamp does not light.	LOCATE and REPAIR the open in the CKT 2409 (BRN) wire between IP Fuse Block and the Ashtray Lamp connector.
2. Connect a test lamp between Ashtray Lamp connector C224 Cavity B for the CKT 1050 (BLK) wire and ground.	Test lamp lights.	REPLACE the Ashtray Lamp bulb.
	Test lamp does not light.	LOCATE and REPAIR the open in the CKT 1050 (BLK) wire between thr Ashtray Lamp connector and Ground G203.

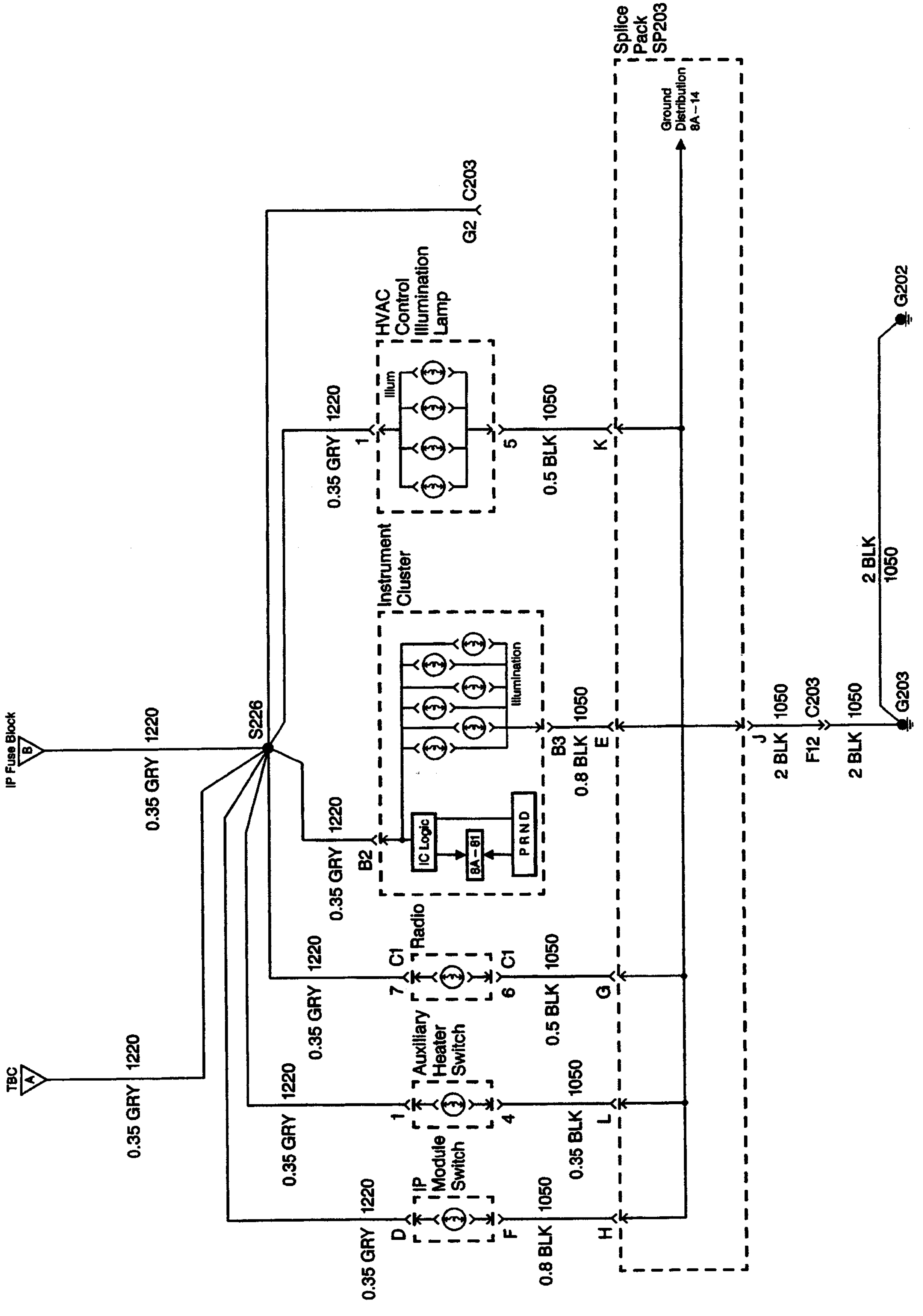
CIRCUIT OPERATION

Voltage is supplied at all times from the CTSY and LPS Fuses to the Courtesy Lamps, Dome and Reading Lamps, and IP Compartment Box Lamp. The Courtesy and Dome and Reading Lamps turn on when a ground path is provided by the Headlamp and Panel Dimmer Switch or one of the Door Jamb Switches. The IP Compartment Box Lamp and Vanity Lamps have switches that provide ground paths when the switches close.

BLANK

INTERIOR LIGHTS: DIMMING


Underhood Bussed Electrical Center (UBEC)
Hot At All Times
Power Distribution 8A-10
PARK LP 20 A
A
B
B12
C1
0.8 ORN
240
P100
C10
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
3
1
5
2
C11
A11
0.8 LT BLU
74
Exterior Lights 8A-110
0.8 LT BLU
74
C203
K11
0.8 LT BLU
74
M6
IP Fuse Block
ILLUM Fuse 12 10 A
A
B
N5
0.35 BRN
2409
Interior Lights 8A-114
Truck Body Control Module (TBC)
Park Lamp Relay
A5
C2
0.8 ORN
240
1080
0.35 WHT
C203
B10
0.8 ORN
240
Headlamp Switch
Park
Head
Park
Auto
B
A
0.8 LT BLU
74
Ground Distribution 8A-14
SP203
Ground Distribution 8A-14
0.5 BLK
1050
A
J
2 BLK
1050
C203
F12
2 BLK
1050
2 BLK
1050
G203
G202
Headlamp Request
C3
B8
N
Head
Park
Head
Auto
Park
Interior Lamps Defeat
Interior Lamp Defeat
B6
J
E
0.8 BLK
1050
IP Dimming Switch
Dome Lamp
A2
G
Dome Lamp Switch
K
0.8 DK GRN
44
K8
IP Fuse Block
ILLUM Fuse 5 10 A
A
B
L7
0.35 GRY
1220
B
S205
Dimming Pot
A5
0.35 GRY
1220
A
S205

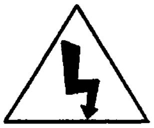

IP Fuse Block
B
0.35 GRY
1220
S226
TBC
A
0.35 GRY
1220
G2
C203
0.35 GRY
1220
1
HVAC
Control
Illumination
Lamp
Illum
5
0.5 BLK
1050
K
Splice
Pack
SP203
Ground
Distribution
8A-14
Instrument
Cluster
Illumination
IC Logic
8A-81
P R N D
0.35 GRY
1220
B2
B3
0.8 BLK
1050
E
J
2 BLK
1050
F12
C203
2 BLK
1050
G203
2 BLK
1050
G202
0.35 GRY
1220
7
C1
Radio
C1
6
0.5 BLK
1050
G
0.35 GRY
1220
1
Auxiliary
Heater
Switch
4
0.35 BLK
1050
L
0.35 GRY
1220
D
IP
Module
Switch
F
0.8 BLK
1050
H

INTERIOR LIGHTS: DIMMING

Interior Lights: Dimming Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Ground Distribution: 8A-14	8A-14-0
Instrument Cluster: 8A-81	8A-81-0
Exterior Lights: 8A-110	8A-110-0
Interior Lights: 8A-114	8A-114-0

Interior Lights: Dimming Schematic Icon Table

Icon	Icon Definition
	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.
	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

Interior Lights: Dimming Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Auxiliary Heater (FFH) Switch	Left of steering column in IP			31
Body Bussed Electrical Center	Behind center of IP			78
Headlamp Switch	Left of steering wheel, in IP	34	35	54
HVAC Control Illumination Lamp	Behind HVAC controls	49	50	55
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
IP Fuse Block	LH side of instrument panel	33	34	76
IP Lamp Dimmer Switch	Part of head lamp switch	34	35	
IP Module Switch	Center of dash, right of steering wheel			44
Park Lamp Relay	In body bussed electrical center (BBEC)			
Radio C1	Center of IP behind Radio	56	57	56
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Truck Body Control Module (TBC)—C3	Part of multifunction switch on steering column	55	56	60
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80

Name	Location	201-Pg	Fig.	Conn.
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
P100	Below brake master cylinder at bulkhead	25	26	
S226	In I/P harness run channel 8 cm from center I/P breakout toward TBC	41	42	
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			

Interior Lights: Dimming Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	Place headlamp switch in the Park position. Move IP dimmer switch from min to max position.	All lamps that are controlled through the dimmer switch should change intensity with movement of the switch.	• *Controlled lamps do not illuminate* • *None of the lamps dim.* • *One or more lamps dim.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

Controlled Lamps Do Not Illuminate

Step	Action	Value(s)	Yes	No
1	Inspect PARKLP fuse in underhood bussed electrical center (UBEC). Is the fuse open?	—	Go to *Step 12*	Go to *Step 2*
2	Inspect ILLUM fuse 5 in IP fuse block. Is the fuse open?	—	Go to *Step 13*	Go to *Step 3*
3	1. Remove fuse 5. 2. Connect a test lamp between fuse 5 cavity A and ground. 3. Turn ignition on and place headlamp switch in the PARK or HEAD position. 4. Move IP dimming switch from low to high position. Does the test lamp dim and brighten with the IP dimming switch movement?	—	Go to *Step 4*	Go to *Step 7*
4	Connect a self-powered test lamp between CKT 1050 (BLK) wire cavity J at SP203 and ground. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 6*
5	Inspect SP203 for damage. Repair or replace as necessary. If SP203 is OK, locate and repair open CKT 1220 (GRY) wire Did you complete the wire repair?	—	System OK	—
6	Locate and repair open CKT 1050 (BLK) wire. Did you complete the wire repair?	—	System OK	—
7	Backprobe with a test lamp between CKT 240 (ORN) wire cavity B12 at headlamp switch and ground. Does the test lamp light?	—	Go to *Step 9*	Go to *Step 8*

INTERIOR LIGHTS: DIMMING

Step	Action	Value(s)	Yes	No
8	Locate and repair open CKT 240 (ORN) wire. Did you complete the wire repair?	—	System OK	—
9	1. Backprobe with a test lamp between CKT 44 (DK GRN) wire cavity K at headlamp switch and ground. 2. Turn ignition on and place headlamp switch in the PARK or HEAD position 3. Move IP dimming switch from low to high position Does the test lamp dim and brighten with the IP dimming switch movement?	—	Go to *Step 10*	Go to *Step 11*
10	Locate and repair open CKT 44 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
11	Replace headlamp switch. Did you complete the headlamp switch replacement?	—	System OK	—
12	Locate and repair short to ground in park lamp circuit. Did you complete the wire repair?	—	System OK	—
13	Locate and repair short to ground in CKT 1220 (GRY) wire. Did you complete the wire repair?	—	System OK	—

None Of The Lamps Dim

Step	Action	Value(s)	Yes	No
1	1. Remove fuse 5. 2. Connect a test lamp between fuse 5 cavity A and ground. 3. Turn ignition on and place headlamp switch in the PARK or HEAD position 4. Move IP dimming switch from low to high position Does the test lamp dim and brighten with the IP dimming switch movement?	—	Go to *Step 2*	Go to *Step 3*
2	Locate and repair short to voltage in CKT 1220 (GRY) wire. Did you complete the wire repair?	—	System OK	—
3	1. Remove headlamp switch. 2. Connect a digital multimeter between pin B and pin K of headlamp switch. 3. Put headlamp switch in the PARK or HEAD position and move the IP dimmer switch from high to low. Does the resistance vary with the IP dimming switch movement?	—	Go to *Step 4*	Go to *Step 5*
4	Locate and repair short to voltage in CKT 44 (DK GRN) wire. Did you complete the wire repair?	—	System OK	—
5	Replace headlamp switch. Did you complete the headlamp switch replacement?	—	System OK	—

One Or More Lamps Dim

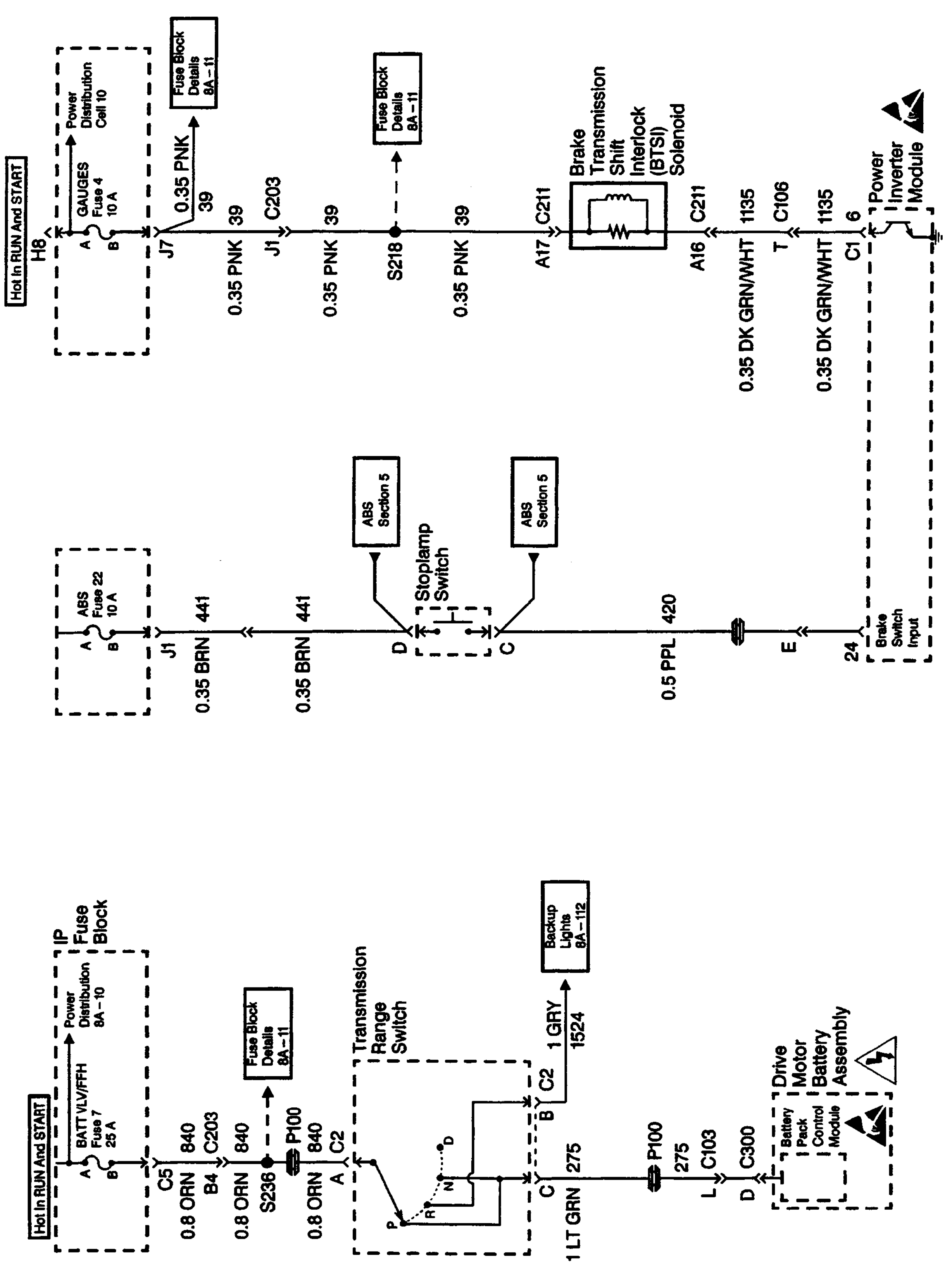
Step	Action	Value(s)	Yes	No
1	1. Remove inoperative bulb. 2. Inspect bulb and socket. Is the bulb open or the socket damaged?	—	Go to *Step 2*	Go to *Step 3*
2	Replace bulb or socket as necessary. Note: If bulb is not serviceable, replace component. Did you complete the repair?	—	System OK	—
3	1. Turn headlamp switch to the Park position. 2. Connect a test lamp between ground and the inoperative bulb(s) CKT 1220 (GRY) wire. 3. Turn IP dimmer switch to full brightness position. Does the test lamp light?	—	Go to *Step 5*	Go to *Step 4*
4	Locate and repair open CKT 1220 (GRY) wire between S205 and the inoperative bulb(s). Did you complete the wire repair?	—	System OK	—
5	Connect a test lamp between CKT 1220 (GRY) wire and CKT 1050 (BLK) wire at inoperative bulb(s) connector. Does the test lamp light?	—	Go to *Step 6*	Go to *Step 7*
6	Inspect contact surfaces and circuit boards and replace as necessary. Did you complete the repair?	—	System OK	—

CIRCUIT OPERATION

With the headlamp in the park or head position, voltage is supplied to the IP dimmer switch. Voltage passes through the dimmer switch to the IP fuse block fuse 5 to the illumination lamps.

The intensity of the illumination lamps is controlled via the dimmer switch. The rheostat in the dimmer switch varies voltage to the lamps, which also varies lamp intensity. The lamps are permanently grounded so they light when ever the headlamp switch is turned on.

BRAKE TRANSMISSION SHIFT INTERLOCK (BTSI)


Hot In RUN And START
H8
A
GAUGES
Fuse 4
10 A
B
Power Distribution Cell 10
Fuse Block Details 8A – 11
J7
0.35 PNK
39
J1
C203
S218
A17
C211
Brake Transmission Shift Interlock (BTSI) Solenoid
A16
0.35 DK GRN/WHT
1135
T
C106
C1
6
Power Inverter Module
ABS
Fuse 22
10 A
0.35 BRN
441
ABS Section 5
Stoplamp Switch
D
C
0.5 PPL
420
E
24
Brake Switch Input
IP Fuse Block
BATT VLV/FFH
Fuse 7
25 A
Power Distribution 8A – 10
C5
0.8 ORN
840
B4
S236
P100
C2
Transmission Range Switch
P
R
N
D
1 GRY
1524
Backup Lights 8A – 112
1 LT GRN
275
C103
L
C300
Battery Pack Control Module
Drive Motor Battery Assembly

Brake Transmission Shift Interlock Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Fuse Block Details: 8A-11	8A-11-0
Backup Lamps: 8A-112	8A-112-0

Brake Transmission Shift Interlock Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Battery Pack Control Module	Inside drive motor battery pack assembly			
Brake Transmission Shift Interlock (BTSI) Actuator	On steering column above knee bolster	39	40	3
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
IP Fuse Block	LH side of instrument panel	33	34	76
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Transmission Range Indicator Switch C2	Below drive motor, on left side, near axle	23	24	31
C103	Chassis harness to propulsion harness, near battery junction block			99
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
P100	Below brake master cylinder at bulkhead	25	26	
S236				

Brake Transmission Shift Interlock Diagnostic System Check

Step	Action	Normal Results	Abnormal Result*
1	With the ignition off, move the shift lever out of PARK.	Shift lever moves freely out of PARK.	• *Shift lever stays in PARK with ignition off.*
2	Turn ignition Switch to the RUN position. Attempt to move shift lever out of PARK.	Shift lever is locked in PARK Position.	• *Shift lever will not lock in PARK position with the key in the RUN position.*
3	With ignition Switch in the RUN position, step on brake pedal and attempt to move shift lever out of PARK.	Shift lever moves freely out of PARK.	• *Shift lever is locked in PARK with key on and brake pedal depressed.*
*** Refer to the appropriate symptom diagnostic table for the applicable abnormal result**			

BRAKE TRANSMISSION SHIFT INTERLOCK (BTSI)

Shift Lever Stays In PARK With ignition Off

Step	Action	Value(s)	Yes	No
1	1. Disconnect C211. 2. Attempt to move the shift lever out of PARK. Did the shift lever move out of PARK?	—	Go to *Step 2*	Go to *Step 5*
2	Connect a test lamp between CKT 39 (PNK) wire and ground. Does the test lamp light?	—	Go to *Step 3*	Go to *Step 4*
3	Locate and repair short to voltage in circuits CKT 39 (PNK) wire. Did you complete the wire repair?	—	System OK	—
4	Replace key lock (BTSI) solenoid. Did you complete the key lock (BTSI) solenoid replacement?	—	System OK	—
5	Inspect key lock (BTSI) solenoid. Is the key lock (BTSI) solenoid stuck in the lock position?	—	Go to *Step 6*	Go to *Step 7*
6	Replace key lock (BTSI) solenoid. Did you complete the key lock (BTSI) solenoid replacement?	—	System OK	—
7	Locate and repair broken or binding shift mechanism. Did you repair the shift mechanism?	—	System OK	—

Shift Lever Will Not Lock In PARK Position With The Key In The RUN Position

Step	Action	Value(s)	Yes	No
1	Using a scan tool check the Battery Pack Control Module for DTC 285. Is DTC 285 present?	—	Go to *Battery Pack Controls Section 6A*	Go to *Step 2*
2	Using a scan tool check the Drive Motor Control Module for DTC 95. Is DTC 95 present?	—	Go to *Drive Motor Controls Section 6A*	Go to *Step 3*
3	1. Turn ignition Switch to the RUN position. 2. Place the shift lever in PARK. 3. Connect a test lamp between ground and both terminals on the back of gauges fuse in the underhood bussed electrical center (UBEC) Did the test lamp light at both terminals?	—	Go to *Step 7*	Go to *Step 4*
4	Did the test lamp light at one terminal?	—	Go to *Step 5*	Go to *Step 6*
5	Locate and repair short to ground in circuitry between gauges fuse and key lock (BTSI) solenoid Did you complete the wire repair?	—	System OK	—
6	Locate and repair open in power supply to gauges fuse. Did you complete the wire repair?	—	System OK	—

Step	Action	Value(s)	Yes	No
7	1. Disconnect connector C1 at the Power Inverter Module. .g 2.Ground Pin 6 at connector C1. Does the shift lever lock?	—	Go to *Step 8*	Go to *Step 9*
8	Replace the Power Inverter Module. Did you complete the repair?	—	System OK	—
9	1. Disconnect connector C211 at the BTSI solenoid. 2. Connect a test lamp between ground and CKT 39 (PNK) wire cavity A17. Does the test lamp light?	—	Go to *Step 11*	Go to *Step 10*
10	Locate and repair open CKT 39 (PNK) wire. Did you complete the repair?	—	System OK	—
11	1. Connect a fused jumper wire between CKT 1135 (DK GRN/WHT) wire cavity 6 at C1and ground. 2. Connect a test lamp between B+ and CKT 1135 (DK GRN/WHT) wire cavity A16 at C211. Does the test lamp light?	—	Go to *Step 13*	Go to *Step 12*
12	Locate and repair open CKT 1150 (DK GRN/WHT) wire. Did you complete the wire repair?	—	System OK	—
13	1. Locate and repair open in steering column wiring to key lock (BTSI) solenoid. 2. If the wiring is OK, replace the solenoid Did you complete the repair?	—	System OK	—

Shift Lever Is Locked In PARK With Key On And Brake Pedal Depressed

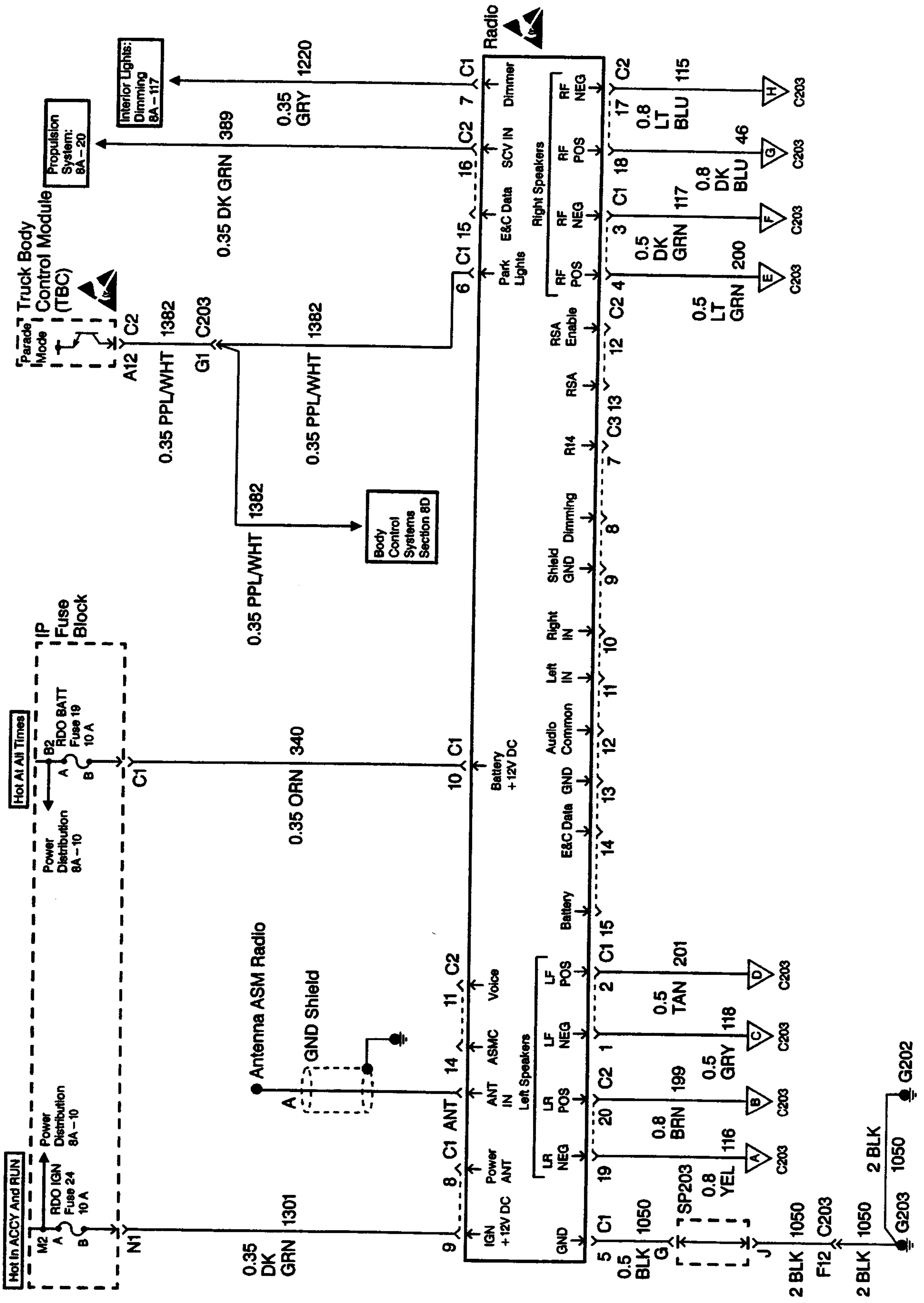
Step	Action	Value(s)	Yes	No
1	Using a scan tool check the Drive Motor Control Module for DTC 96 Is DTC 96 present?	—	Go to *Driver Motor Controls Section 6A*	Go to *Step 2*
2	Disconnect connector C1 at the Power Inverter Module. Does the shift lever release?	—	Go to *Step 3*	Go to *Step 4*
3	Replace the Power Inverter Module. Did you complete the repair?	—	System OK	—
4	Connect a DMM between connector C1 terminal 6 at the Power Inverter Module and ground. Is the voltage above the specified value?	10 Volts	Go to *Step 5*	Go to *Step 6*
5	Locate and repair broken or binding interlock mechanism. If the mechanism is OK, Replace key lock (BTSI) solenoid. Did you complete the repair?	—	System OK	—
6	Locate and repair short to ground in CKT 1135 (DK GRN/WHT) wire. Did you complete the wire repair?	—	System OK	—

CIRCUIT OPERATION

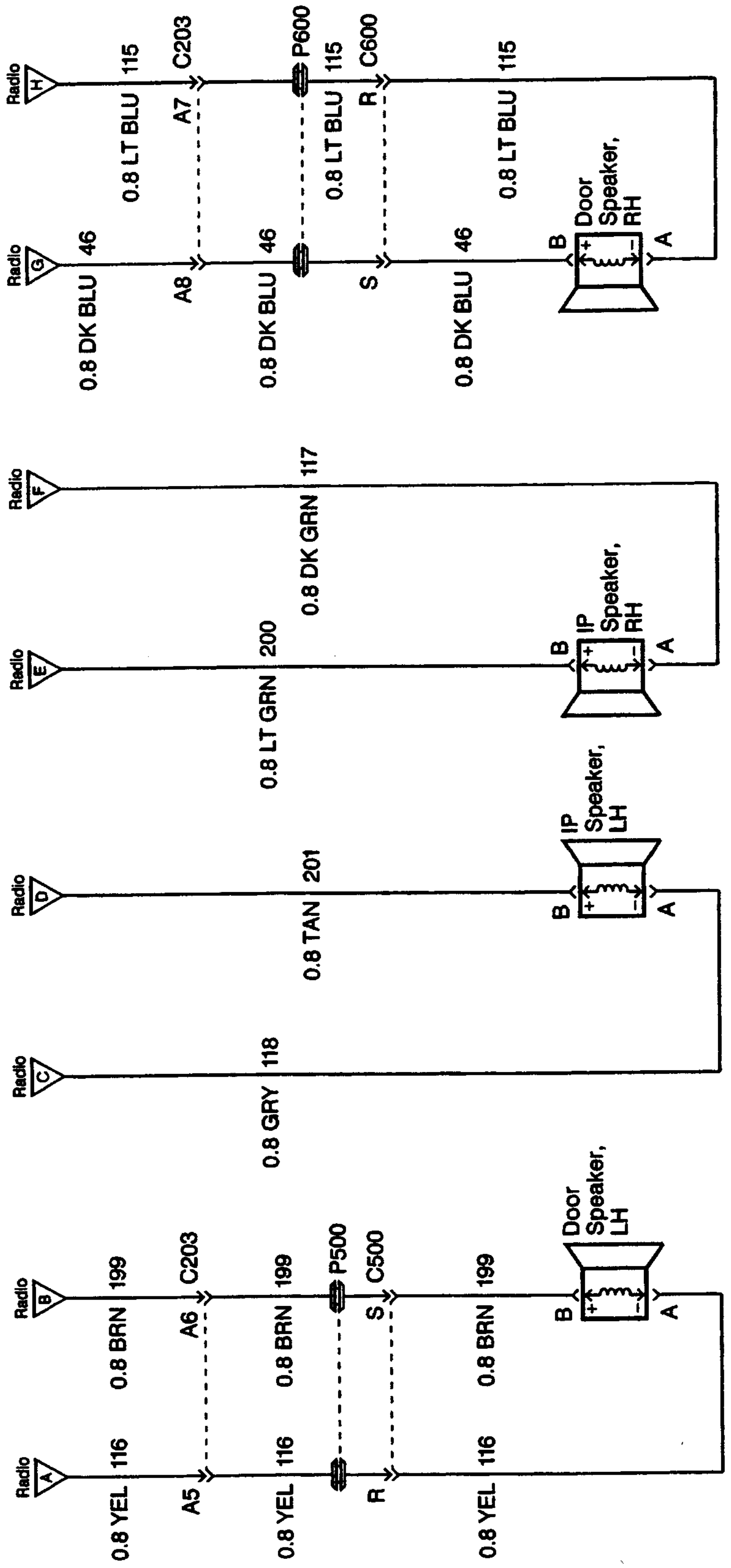
When the Brake Transmission Shift Interlock (BTSI) relay is energized, the solenoid locks the shift lever mechanism in PARK. When not energized, the key lock (BTSI) solenoid returns to the unlocked position. Gauges fuse supplies ignition switch RUN or START voltage to the coil side of the BTSI relay. Fuse 8 supplies battery voltage to the switched side of the BTSI relay. When the BTSI relay is energized by turning off the ignition switch, voltage is supplied to the key lock (BTSI) solenoid located in the steering column. Ground is provided at G103 and is permanently connected to the key lock (BTSI) solenoid. With the ignition switch in the RUN or START position, the shift lever in PARK, and the brake pedal released, the solenoid is energized. This locks the shift lever in PARK. Note that the BTSI portion of the stoplamps switch is closed with the brakes released. Depressing the brake pedal opens the switch causing the solenoid to de-energize, unlocking the shift lever. The BTSI portion of the transmission range indicator switch is closed in PARK only. The circuit is not active with the ignition switch off to facilitate towing.

BLANK

RADIO/AUDIO SYSTEM



Radio
Truck Body Control Module (TBC)
Parade Mode
Interior Lights: Dimming 8A-117
Propulsion System: 8A-20
Body Control Systems Section 8D
IP Fuse Block
Hot At All Times
RDO BATT Fuse 19 10 A
Power Distribution 8A-10
Hot In ACCY And RUN
RDO IGN Fuse 24 10 A
Antenna ASM Radio
GND Shield
0.35 GRY 1220
0.35 DK GRN 389
0.35 PPL/WHT 1382
0.35 ORN 340
0.35 DK GRN 1301
A12 C2
G1 C203
B2 A B C1
M2 A B N1
Dimmer
SCV IN
E&C Data
Park Lights
Battery +12V DC
Voice
ASMC
ANT IN
Power ANT
IGN +12V DC
GND
Right Speakers
RF NEG
RF POS
Left Speakers
LF POS
LF NEG
LR POS
LR NEG
RSA Enable
RSA
R14
Dimming
Shield GND
Right IN
Left IN
Audio Common
GND
E&C Data
Battery
0.8 LT BLU 115
0.8 DK BLU 46
0.5 DK GRN 117
0.5 LT GRN 200
0.5 TAN 201
0.5 GRY 118
0.8 BRN 199
0.8 YEL 116
0.5 BLK 1050
SP203
2 BLK 1050
F12 C203
G203
G202
C203
A
B
C
D
E
F
G
H


Radio H
0.8 LT BLU 115
C203
A7
P600
0.8 LT BLU 115
C600
R
0.8 LT BLU 115
Radio G
0.8 DK BLU 46
A8
0.8 DK BLU 46
S
0.8 DK BLU 46
B
A
Door Speaker, RH
Radio F
0.8 DK GRN 117
Radio E
0.8 LT GRN 200
B
A
IP Speaker, RH
Radio D
0.8 TAN 201
B
A
IP Speaker, LH
Radio C
0.8 GRY 118
Radio B
0.8 BRN 199
C203
A6
0.8 BRN 199
P500
C500
S
0.8 BRN 199
B
A
Door Speaker, LH
Radio A
0.8 YEL 116
A5
0.8 YEL 116
R
0.8 YEL 116
+
-

Radio/Audio System Schematic Reference Table

Reference on Schematic	Location
Power Distribution: 8A-10	8A-10-0
Drive Motor Unit: 8A-20	8A-20-0
Interior Lights: Dimming: 8A-117	8A-117-0

Radio/Audio System Schematic Icon Table

Icon	Icon Definition
⚠	**Refer to Electrostatic Discharge (ESD) Sensitive Devices in Symbols, Page 8A-3-0.**
⚡	**This Icon is used to alert the technician. The circuits shown with this icon on the schematic contain high voltage. Refer to the *High Voltage Power System* caution in *General Information.***

Radio/Audio System Component Location Table

Name	Location	201-Pg	Fig.	Conn.
Door Speaker, LH	In lower front corner of left door	51	52	5
Door Speaker, RH	In lower front corner of right door	51	52	6
IP Fuse Block	LH side of instrument panel	33	34	76
IP Speaker LH	Left corner of IP	38	39	13
IP Speaker RH	Left corner of IP	38	39	13
Radio C1	Center of IP behind Radio	56	57	56
Radio C2	Center of IP behind Radio	56	57	57
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C500	Crossbody harness to front door harness, behind door panel above speaker			103
C600	Crossbody harness to front door harness, behind door panel above speaker	63	64	104
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
P500	Between Front Door and Cab	51	52	
P600	Between Front Door and Cab	51	52	
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			

SYSTEM DIAGNOSIS—RADIO

Troubleshooting Hints:

Audio System Diagnostic Overview

1. Verify customer complaint.
2. Refer to: Delco Sound Service Guide (DE SSG) and Dealer Service Manuals; fill out the Service Writer Form provided in the Delco Sound Service Guide (DE SSG).
3. Follow radio service procedures.
4. If technical assistance is required, have all the pertinent information available before placing the call.
5. For a more complete diagnostic overview, consult the DE SSG.

Identifying Concerns

- Check for technical service bulletins.
- Check the Dealer Communication system for any applicable Preliminary Information (P/I) for customer concerns.
- Check for stored diagnostic trouble codes. Refer to SECTION 6.
- For reception concerns, determine if the station is obtainable in the customer's listening area.
- For an FM reception concern, refer to the FM reception SECTION in the DE SSG.
- For an AM reception concern, refer to the AM reception SECTION in the DE SSG.
- To test for audio reception/noise, position the vehicle outside of the building with the hood down.
- Duplicate the customer's complaint before trying to diagnose the system.
- Have the customer demonstrate the condition.
- Test drive the vehicle with the customer and then test drive another similar model vehicle (with a similar audio system) to do a comparison of the two vehicles to determine if the condition is abnormal.
- Before diagnosing, identify components, their features and the customer's complaint.
- Determine if any aftermarket equipment is Installed on the vehicle.
- Disconnect the aftermarket equipment and determine if the customer's complaint still exists.
- Follow GM guidelines for Installation of aftermarket components.
- Refer to the DE SSG.
- Perform the following steps to identify a noisy component:

1. Identify ignition key switch position in which the noise appears, such as: ACC, key ON engine not running, and key ON engine running.
2. Remove fuses one at a time until the complaint condition has been eliminated.
3. Mark the complaint fuse(s) and re-install all fuses and circuit breakers.
4. Refer to SECTION 8A-10 and SECTION 8A-11 to identify all systems and components powered by the complaint fuse(s).
5. Disconnect the components powered by the complaint fuse(s) one at a time until the complaint condition has been eliminated and the noisy component is identified.
6. Check the ground integrity of the complaint causing component.
   - An interference condition is not necessarily an audible noise.
   - Most noises can be found on weak stations near the low end of the band and are considered to be a normal condition.
   - Ignition noise on FM could indicate a possible defective ignition system.
   - Malfunctioning and marginal components, relays, and solenoids may induce noise and/or poor reception.

Corrective Action

- Use proper tools for diagnostics and Repairs.
- Follow ESD guidelines.
- Use available noise suppression devices:
  - — 220 mF (50V) capacitor GM P/N 1227895
  - — 0.47 mF capacitor GM P/N 1227894
  - — Fuse block capacitor GM P/N 469328
  - — Feed through capacitor GM P/N 477371
  - — Filter package GM P/N 1224205
  - — Turn signal suppression GM P/N 3861565
  - — Fuel pump suppresser GM P/N 25027405
  - — 21-inch braided ground strap GM P/N 8910791
  - — 19-inch braided ground strap GM P/N 6286800
  - — 10.5-inch braided ground strap GM P/N 6287160
  - — 8.5-inch braided ground strap GM P/N 12091511

RADIO/AUDIO SYSTEM

- Utilize the test tape/CD Diagnostic Kit GM P/N J 39916-A to optimize proper audio diagnostics.
- If the condition requires the radio to be sent to the service center, describe the symptoms on the warranty form accurately. Along with the warranty form, send a copy of the Service Writer Check List with the unit.
- Do not leave a CD disc or tape in the car. Extreme heat could cause permanent damage.
- Cassette tapes could be damaged if not stored in the case. The vibration in the vehicle can cause the tape to unwind inside the cartridge.
- Use trouble trees/noise charts in the DE SSG.
- Before removing speaker(s), Check all connectors and wiring to the speaker(s). Examine the connectors for bent or loose pins. Refer to Troubleshooting Procedures in SECTION 8A-4.
- If a test antenna is used in diagnostics, ground the antenna base to the vehicle body and do not hold the mast.

Important:

- Check the antenna coax connectors for corrosion or bad connections/crimps.
- Route coax separately from the other wires.
- Shield antenna coax interconnections with aluminum or nickel tape as described in the DE SSG.
- Check all vehicle grounds, not just radio and antenna grounds. Refer to the antenna diagnostic SECTION.
- Coated screws or bolts can act as poor grounds.
- Always use a braided ground strap when applying grounds. Keep the ground strap as short as possible, the shorter the ground strap the better.
  - — When shielding the dash, wires, hoses (most hoses are conductive unless they have a white stripe), etc., use aluminum foil tape or nickel tape to shield against magnetically induced interference. For optimum results, try varying the following ground techniques:
  - — Add a ground at both ends of the tape.
  - — Add a ground to just one end of the tape.
  - — Do not add ground to the tape.
  - — When shielding a harness with tape, attach a ground strap to the end of the tape and then wrap the strap 360° around the tape securing the other end of the strap to a known good chassis ground.
  - — Any interference is best corrected by suppression at the source of the interference, if possible.
  - — Care should be used when applying suppression. Signal wires (such as sensor outputs, clock, and communication circuits) cannot be suppressed. Battery and ignition wires can be suppressed. After adding any suppression, all vehicle systems (even those not related to the audio system) should be Checked for proper operation and function.
  - — Interference can usually be eliminated by shielding/grounding or suppressing.
  - — Capacitors work best on switch pops and low frequency noise. Filters work best on high frequency whines and static.
  - — Whenever possible, make a test harness that includes filters and capacitors. Always Check the effectiveness and operation before permanently Installing a FIX.
  - — Recommended capacitor application for an audible pop induced from a switching operation is:
- Add a capacitor across the contacts of the switch.
- Add a capacitor from the hot side of the switch to ground.
- Add a capacitor to each side of the switch to ground.
- If a complaint condition is only present with the ignition key in the RUN position and the engine running, perform the following Checks:
  - — Check the integrity of the engine compartment grounds.
  - — Check for malfunctioning relays, solenoids, or other components which may be inducing noise or poor reception.
  - — Check the ground integrity of the complaint causing component.
- For noise and/or poor reception, perform the Antenna System Test and make the necessary Repairs.

Radio Does Not Retain Stations In Memory Or Clock Does Not Operate

TEST	RESULT	ACTION
1. Disconnect radio connector C1. Connect test lamp from CKT 1140 (ORN) wire at radio connector C1 to ground.	Test lamp lights.	Remove radio and send in for Repair.
	Test lamp does not light.	Locate and Repair open in CKT 1140 (ORN) wire between radio connector C1 and IP fuse block.

Radio Illumination Lamps Do not Come On

Test	RESULT	ACTION
1. Disconnect radio connector C1. Place headlamp switch to PARK and panel dimmer switch to maximum illumination. Connect test lamp from CKT 1382 (PPL/WHT) wire to ground.	Test lamp lights.	Remove radio and send in for Repair.
	Test lamp does not light.	Locate and Repair open in CKT 1382 (PPL/WHT) wire between radio connector to IP fuse block.

Display Dimming Function Will Not Operate

TEST	RESULT	ACTION
1. Disconnect radio connector. Place headlamp switch in PARK. Connect test lamp from CKT 1220 (GRY) wire at radio connector to ground.	Test lamp lights.	Remove radio and send in for Repair.
	Test lamp does not light.	Locate and Repair open in CKT 1220 (GRY) wire between radio connector and IP fuse block.

Display Is Inoperative, No Sound From Any Speaker

TEST	RESULT	ACTION
1. Disconnect radio connector C1. Place ignition switch in RUN. Connect a test lamp from CKT 1140 (ORN) wire at radio to ground.	Test lamp lights.	GO to step 2
	Test lamp does not light.	Locate and Repair poor connection or open in CKT 1140 (ORN) wire between radio connector and IP fuse block.
2 With a digital multimeter, measure voltage at radio connector C1 between Terminal 10 and Terminal 5.	Voltage is approximately equal to battery voltage.	GO to step 3.
	Voltage is not approximately equal to battery voltage.	Repair poor connection or open in CKT 151 (BLK) between radio connector C1 Terminal 5 and G102
3. With a digital multimeter, measure voltage at radio connector between Terminal 9 and Terminal 5.	Voltage is approximately equal to battery voltage.	Check radio connector C1 for terminals shorted together, Check for poor connections. If OK, service radio.
	Voltage is not approximately equal to battery voltage.	Repair poor connection or open in CKT 43 (YEL) between radio connector C1 Terminal 9 and IP fuse block.

No Sound From One Speaker

TEST	RESULT	ACTION
1. ignition switch Off. Disconnect speaker connector. With a digital multimeter, measure resistance of speaker.	Resistance is between 4 ohms and 15 ohms.	GO to step 2
	Resistance is not between 4 ohms and 15 ohms.	Replace speaker.
2 Disconnect radio speaker connector. With a digital multimeter, measure the resistance at the speaker connector from Terminal A to ground.	Resistance is infinite.	GO to step 3.
	Resistance is not infinite.	Repair short to ground in speaker feed circuit.
3. With a digital multimeter, measure resistance at speaker connector from Terminal B to ground.	Resistance is infinite.	GO to step 4.
	Resistance is not infinite.	Repair short to ground in speaker feed circuit.
4. Reconnect speaker connector. With a digital multimeter, measure resistance at radio connector for speaker feed circuits.	Resistance is between 4 ohms and 15 ohms.	Check for poor connections at radio or speaker. If OK, service radio.
	Resistance is not between 4 ohms and 15 ohms.	Check for poor connections at speaker or in-line connectors or for open in speaker feed circuits.

Antenna System Test

TEST	RESULT	ACTION
1. Disconnect negative battery cable. Disconnect antenna lead-in connector at the radio receiver. With a digital multimeter, measure resistance between the coax (outer conductor) connector and the negative battery cable. NOTICE: To avoid misdiagnosis be sure to zero meter before taking measurements.	The resistance value is less than 0.15 ohms.	Go to step 2
	The resistance value is greater than 0.15 ohms.	Check the base of the antenna for a good connection to body ground. Check the coaxial cable interconnects for a poor connection or corrosion. Check the ground connection from the battery negative cable to the body. Repair the antenna ground circuit as necessary.
2 Grasp the antenna mast. While observing the digital multimeter, wiggle the antenna.	The digital multimeter indicates no intermittent continuity.	GO to step 3.
	The digital multimeter indicates intermittent continuity.	Check the base of the antenna for a good connection to body ground. Check the coaxial cable interconnects for a poor connection or corrosion. Check the ground connection from the battery negative cable to the body. Repair the antenna ground circuit as necessary.

TEST	RESULT	ACTION
3. With a digital multimeter, measure resistance between the radio coaxial lead-in connector (center conductor) and the antenna mast. NOTICE: To avoid misdiagnosis be sure to zero digital multimeter before taking measurements.	The measured resistance approximately equals less than: • 2 ohms for coax type RG-58 or RG-59. • 3.5 ohms for coax type RG-62 or RG-62M.	GO to step 4.
	The measured resistance approximately equals Not less than: • 2 ohms for coax type RG-58 or RG-59. • 3.5 ohms for coax type RG-62 or RG-62M.	Check the coaxial cable interconnects for a poor connection or corrosion. Repair/Replace the antenna coaxial circuit as necessary and return to the noise and/or poor reception chart.
4. Wile observing the digital multimeter, wiggle the antenna coax.	The digital multimeter indicates intermittent continuity.	Check the coaxial cable interconnects for a poor connection or corrosion. Repair/Replace the antenna coaxial circuit as necessary and return to the noise and/or poor reception chart.
	The digital multimeter indicates no intermittent continuity.	Return to the noise and/or poor reception chart.

Use And Construction Of A Noise Sniffer

The noise sniffer can be used along with the vehicle's radio to locate hot spots which are generating radio noise interference. These hot spots can be found in the harnesses, in the upper part of the dash or even between the hood and the windshield. The sniffer can be made from an old piece of antenna lead-in from a mast or power antenna. The longer the lead-in the better. Make the noise sniffer as shown in Figure 1.

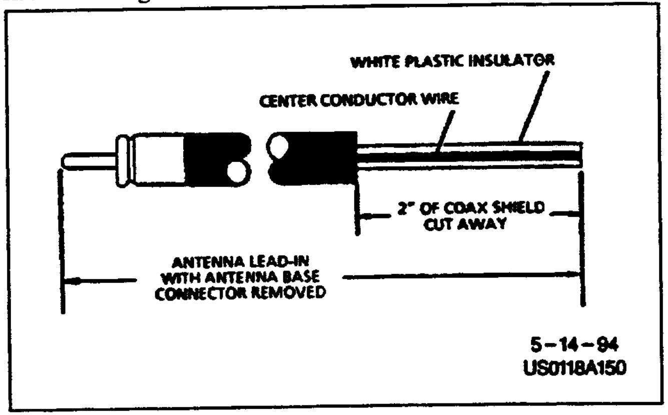

WHITE PLASTIC INSULATOR
CENTER CONDUCTOR WIRE
2" OF COAX SHIELD CUT AWAY
ANTENNA LEAD-IN WITH ANTENNA BASE CONNECTOR REMOVED
5-14-94
US0118A150

Figure 1.

The 2" section with the black coating and braided shield stripped back becomes the antenna when the sniffer is plugged into the radio's antenna socket. It can then be used to probe and search out hot spots. To use the sniffer:

1. While listening to the complaint noise, disconnect the antenna and plug the sniffer into the antenna socket.
2. Turn the radio volume up.
3. Search for the noise source, keeping fingers off the probe.

   When Checking for noise on a wire, the best results will be achieved when the sniffer is placed parallel to the wire, see Figure 2

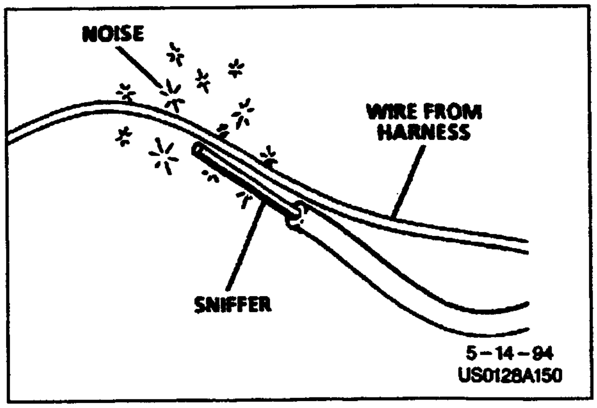


Figure 2

Customer's Tips

How To Enjoy FM Stereo

1. Select Stations Within Range—The best FM fidelity will be obtained from stations within the 10-40 mile range. Beyond that, noise or flutter may begin to appear due to the line of sight range limitations of FM signals.

   Solution: * Reduce treble response by moving the treble control down (or to the left) in fringe areas. On EQ radios, slowly slide the 10K control down.

2. Realize Tall Structures Can Interfere—Tall buildings or hills may cause shadows or cancellation of FM signals (this is similar to the ghost or flutter effect seen on television sometimes when airplanes are flying in the vicinity). It will sound like a pop or momentary hiss.

   Solution: * Reduce the treble or 10K setting to a lower volume.
3. Interference From Another Station—Although the circuits in DELCO receivers are the most advanced available, there are rare instances where a station being listened to will be interfered with by another station. This only happens when the stations are on almost the same frequency and certain geographical criteria are present.

   Solution: * Select another station or switch to a tape or CD.

How To Enjoy AM

Reception Characteristics.

- AM does not have the flutter characteristics of FM (caused by tall buildings, hills, etc.). However, it is subject to interference from power lines, neon signs, atmospheric conditions and unwanted stations.

Ways To Reduce Noise

1. Move treble control down.
2. Tune to a stronger station.

Circuit Operation

Radio

Voltage to the radio is available at all times through the CKT 1140 (ORN) wire. This circuit provides voltage for radio station memory storage. It also provides voltage for the clock memory. With the ignition switch in ACC or RUN, voltage is supplied to the radio through the fuse 11 and the YEL (43) wire. Each speaker has its own pair of leads. The radio/clock display brightness is at full intensity with the ignition switch in ACC or RUN; voltage is supplied by the YEL (43) wire. When the PARK or Headlamps are turned on, voltage is supplied to the radio through the CKT 9 (BRN) wire. When the radio senses this signal, the radio switches voltage for the display from the YEL (43) wire to the CKT 8 (GRY) wire. The display brightness is then controlled by the panel and interior lamps control switch. The radio illumination bulb voltage is supplied by the CKT 8 (GRY) wire.

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ELECTRICAL COMPONENT LOCATION TABLE

Name	Location	201-Pg	Fig.	Conn.
A/C Compressor Motor	Right rear of engine compartment behind (PEB)	2	3	
A/C Condenser Cooling Fan Buffer	Mounted to front of power electronics bay (PEB) bracket	9	10	31
A/C Condenser Cooling Fan	Mounted to rear of radiator core support	9	10	
A/C High Pressure Sensor	At top of bulkhead behind PEB, on A/C High pressure pipe	21	22	23
A/C Low Pressure Sensor	Near bulkhead, behind PEB, on A/C low pressure pipe	21	22	23
Accelerator Pedal Position Sensor (APP)	Part of accelerator pedal assembly mounted above accelerator pedal	35	36	52
Accessory Power Control Module (APM)	Mounted to the lower right bottom of the power electronics bay (PEB)	2	3	61
Accessory Power Control Module (APM) Blindmate Connector	Between PEB and APM	2	3	49
Accessory Power Control Module (APM) Negative Cable	At left rear of APM near bottom	2	3	
Accessory Power Control Module (APM) Positive Cable	At left rear of APM near bottom	2	3	
Ambient Air Temperature Sensor	Mounted to LH rear of grill near center of grill	4	5	0
Ambient Light Sensor	Mounted under RH IP speaker grill			0
Automatic Disconnect Module	Inside drive motor battery pack assembly			74
Auxiliary Heater (FFH)	Mounted under truck, in front of battery pack assembly, between frame rails	28	29	37
Auxiliary Heater (FFH) Relay	RH rear of engine compartment			
Auxiliary Heater (FFH) Service Port	RH side of engine compartment, near blower motor	25	26	1
Auxiliary Heater (FFH) Switch	Left of steering column in IP			31
Ashtray Lamp	Above ashtray	44	45	1
Auxiliary Battery	At right front corner of engine compartment	1	2	
Auxiliary Battery Negative Cable	Between auxiliary battery and RH frame rail	1	2	
Auxiliary Battery Positive Cable	Between auxiliary battery and mega fuse	1	2	
Backup Lamp, LH	Left rear corner of vehicle	52	53	24
Backup Lamp, RH	Right rear corner of vehicle	52	53	24
Battery Pack Air Flow Sensor	Inside battery thermal module	29	30	2
Battery Pack Blower Assembly	Mounted to the front of the battery pack, below the cab	30	31	25
Battery Pack Control Module	Inside drive motor battery pack assembly			
Battery Pack High Voltage Cable	Connected between right rear of power electronics bay (PEB) and drive motor battery pack	2	3	38
Battery Thermal Module (see Battery Pack Blower Assembly)	Mounted to the front of the battery pack, below the cab	0	1	25
Battery Valve Primary Relay	Mounted to bracket at passenger side rear of engine compartment			32
Battery Valve Secondary Relay	Mounted to the front of the battery pack, below the cab			32
Blower Motor	RH side of engine compartment	25	26	2
Blower Motor Relay	RH rear of engine compartment	24	25	38

Name	Location	201-Pg	Fig.	Conn.
Blower Motor Resistor	RH rear of engine compartment in evaporator housing	26	27	33
Body Bussed Electrical Center	Behind center of IP			78
Body Control Interface Module	Mounted to right side of cab behind kick panel	33	34	67
Brake Pressure Warning Switch	Part of brake proportioning valve assembly	14	16	3
Brake Transmission Shift Interlock (BTSI) Actuator	On steering column above knee bolster	39	40	3
Charge Receptacle	Behind front license plate	0	1	50
Charge Receptacle Coolant Valve	On LH rear of core support			42
Charge Receptacle High Voltage Cable	Connected between left front of power electronics bay (PEB) and charge receptacle	15	16	39
Cigar Lighter	Lower center of IP			
Coolant Level Sensor	In bottom of coolant reservoir	25	26	26
Coolant Temp Sensor	In coolant junction block near coolant pump	5	6	4
Coolant Pump Buffer	On coolant pump bracket above front crossmember	5	6	33
Coolant Pump	On front center of crossmember	0	1	
Courtesy Lamp, LH	Below LH side of IP			4
Courtesy Lamp, RH	Below LH side of IP	41	42	5
Courtesy Lamp Relay	In the body bussed electrical center (BBEC)			
Cruise Control Switch (Part of Multifunction Switch)	Part of multifunction switch on steering column			
Data Link Connector (DLC)	Lower LH side of instrument panel	65	66	59
Daytime Running Lamps (DRL) Relay	In underhood bussed electrical center (UBEC)	45	46	39
Dome Lamp and High Mounted Stop Lamp	Rear center of cab	50	51	34
Door Jamb Switch, LH	In LH side of IP			26
Door Jamb Switch, RH	In RH side of IP	38	39	27
Door Speaker, LH	In lower front corner of left door	51	52	5
Door Speaker, RH	In lower front corner of right door	51	52	6
Drive Motor Assembly	In engine compartment below PEB	0	1	
Drive Motor Battery	In battery pack assembly	0	1	
Drive Motor Battery Blower Motor	Inside battery thermal module			
Drive Motor Battery Assembly	Underneath bed between frame rails	17	18	
Drive Motor Battery Temperature Sensor	In battery pack assembly, mounted on drive motor battery			
Drive Motor Control Module	Inside power electronics bay (PEB)			
Drive Motor High Voltage Cable	Connected between middle rear of power electronics bay (PEB) and drive motor assembly	19	20	43
Drive Motor Speed and Direction Sensor	Mounted to LH side of drive motor assembly	22	23	40
Drive Motor Winding Temperature Sensor	Inside drive motor near high voltage cable	23	24	6
Electronic Brake Control Module (EBCM)	Mounted to left inner fender well			

ELECTRICAL COMPONENT LOCATION TABLE

Name	Location	201-Pg	Fig.	Conn.
Electronic Brake Control Module (EBCM) C1	Mounted to left inner fender well	14	15	40
Electronic Brake Control Module (EBCM) C2	Wheel speed sensor harness to electronic brake control module (EBCM)	4	5	53
Electronic Brake Control Module (EBCM) C3	Forward lamps harness to electronic brake control module (EBCM)	14	15	7
Fuel Level Sensor	Mounted in the top of the fuel tank	29	30	7
Fuel Pump	Above fuel tank behind crossmember			8
Headlamp Ground Relay	In underhood bussed electrical center (UBEC)			
Headlamp Power Relay	In underhood bussed electrical center (UBEC)			
Headlamp Switch	Left of steering wheel, in IP	34	35	54
Headlamp, High Beam, LH	In left front corner of truck	54	55	8
Headlamp, Low Beam, LH	In left front corner of truck	54	55	9
Headlamp, High Beam, RH	In left front corner of truck	54	55	9
Headlamp, Low Beam, RH	In left front corner of truck	54	55	10
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C1	Under driver's seat	37	38	62
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM)—C2	Under driver's seat	37	38	68
High-Beam Switch	Part of multifunction switch	3	4	
High-Mounted Stop Light Relay	In underhood bused electrical center			
High Voltage Disconnect	On harness right of brake booster	12	13	35
High Voltage Disconnect Loop Wire Assembly. and Connector	On harness, connected to high voltage disconnect, at right of booster			34
High Voltage Disconnect Relay—K1	Inside drive motor battery pack assembly			10
High Voltage Disconnect Relay—K2	Inside drive motor battery pack assembly			11
Horn Relay	In underhood bused electrical center	45	46	35
Horn Switch	Behind pad in steering wheel	48	49	
Horn, LH	in LH fender behind washer bottle	4	5	11
Horn, RH	In RH fender near auxiliary battery	4	5	12
HVAC Control Illumination Lamp	Behind HVAC controls	49	50	55
HVAC Control C1	Part of HVAC controls in center of IP	49	50	27
HVAC Control C2	Part of HVAC controls in center of IP	49	50	28
HVAC Control C3	Part of HVAC controls in center of IP	49	50	41
Inadvertent Power Relay	In the body bussed electrical center (BBEC)			
IP Compartment Lamp	Inside IP compartment	43	44	12
IP Fuse Block	LH side of instrument panel	33	34	76
IP Lamp Dimmer Switch	Part of head lamp switch	34	35	
IP Module Switch	Center of dash, right of steering wheel			44
IP Speaker LH	Left corner of IP	38	39	13
IP Speaker RH	Left corner of IP	38	39	13
Ignition Switch	On steering column, under column trim panel	39	40	

Name	Location	201-Pg	Fig.	Conn.
Instrument Cluster	LH side of instrument panel, behind steering wheel			63
Jump Start Block	Under hood, inside right fender, at top center of wheel well	26	27	
Key In Ignition Switch	In steering column, part of ignition switch			
License Lamp, LH	Left center of rear bumper	59	60	14
License Lamp, RH	Right center of rear bumper	59	60	14
Outside Air Valve Actuator Motor	Behind right side of IP behind heater ducting	47	48	45
P/B Booster Vacuum Pump	Behind PEB mounted to PEB bracket	2	6	15
P/B Booster Vacuum Switch	On left end of vacuum reserve canister	0	1	15
Park Brake Indicator Switch	On parking brake bracket, near top of pedal arm	40	41	
Park/Turn Signal Lamp, LH Front	Left front corner of front bumper	4	5	28
Park/Turn Signal Lamp, RH Front	Right front corner of front bumper	4	5	29
Park Lamp Relay	In body bussed electrical center (BBEC)			
Park Position Switch	On steering column			
Passenger Side Inflatable Restraint Inflator Module	IP harness to propulsion harness, behind RH side of IP, above hush panel			16
Passlock Sensor	In steering column near ignition cylinder			
Power Electronics Bay (PEB)	In center of engine compartment	0	1	
Power Inverter Module	Inside power electronics bay (PEB)			0
Power Inverter Module C1	Inside power electronics bay (PEB)	9	10	70
Power Inverter Module C2	Inside power electronics bay (PEB)	9	10	64
Power Steering Control Module (PSCM)	Attached to lower right of power electronics bay (PEB)	16	17	
Power Steering Control Module (PSCM) Blindmate Connector	Between PEB and PSCM	16	17	51
Power Steering Pump Motor	On right frame rail near PEB	0	1	
Radio C1	Center of IP behind Radio	56	57	56
Radio C2	Center of IP behind Radio	56	57	57
Refrigerant Reversing Valve	Mounted to right frame rail in engine compartment, behind PEB	21	22	36
Retained Accessory Power Relay	In the body bussed electrical center (BBEC)			
Run 2 Relay	In relay center	45	46	41
Safety Belt Switch	Front body harness to seat belt switch, near base of LH seatbelt receiver	36	37	46
Secondary Battery Valve	Under PEB mounted to left frame rail			16
Side Marker Lamp, LH Front	Left front corner of vehicle	54	55	17
Side Marker Lamp, LH Rear	Left rear corner of vehicle	52	53	17
Side Marker Lamp, RH Front	Right front corner of vehicle	54	55	18
Side Marker Lamp, RH Rear	Right rear corner of vehicle	52	53	18
Stoplamps Switch	On brake pedal mounting bracket, behind LH side of IP	40	41	47
Supplemental Inflatable Restraint Arming Sensor, Rear	Inside crossmember by RH frame rail, behind auxiliary heater	31	32	36

ELECTRICAL COMPONENT LOCATION TABLE

Name	Location	201-Pg	Fig.	Conn.
Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)	Mounted to cab floor under middle of bench seat	47	48	58
Supplemental Inflatable Restraint Discriminating Sensor, LH Front	On left bottom of core support	6	7	37
Supplemental Inflatable Restraint Discriminating Sensor, RH Front	On right bottom of core support	6	7	19
Supplemental Inflatable Restraint Steering Wheel Inflator Module	Under steering wheel	48/39	49/ 40	19
Tail/Stop/Turn Signal Lamp, LH Rear	Left rear corner of vehicle	52	53	29
Tail/Stop/Turn Signal Lamp, RH Rear	Right rear corner of vehicle	52	53	30
Transmission Range Indicator Switch C1	Below drive motor, on left side, near axle	23	24	47
Transmission Range Indicator Switch C2	Below drive motor, on left side, near axle	23	24	31
Truck Body Control Module (TBC)—C1	In power distribution center	55	56	65
Truck Body Control Module (TBC)—C2	Part of multifunction switch on steering column	55	56	66
Truck Body Control Module (TBC)—C3	Part of multifunction switch on steering column	55	56	60
Turn Signal Switch (Part Of Multifunction Switch)	Part of multifunction switch on steering column	39	40	
Turn Signal/Hazard Flasher	Taped to harness below C204	63	64	48
Underhood Bussed Electrical Center (UBEC) Battery Positive Cable	At UBEC	53	54	
Underhood Bussed Electrical Center (UBEC)—C1	At UBEC	53	54	80
Underhood Bussed Electrical Center (UBEC)—C2	At UBEC	53	54	82
Underhood Bussed Electrical Center (UBEC)—C3	At UBEC	53	54	72
Underhood Bussed Electrical Center (UBEC)—C4	At UBEC	53	54	73
Underhood Bussed Electrical Center (UBEC)—C5	At UBEC	53	54	20
Underhood Bussed Electrical Center (UBEC)—C6	At UBEC			20
Underhood Lamp	Under hood, left side, near bottom of hood	10	11	
Wheel Speed Sensor, LH Front	On LH front spindle	6	7	21
Wheel Speed Sensor LH Rear	In LH side of rear axle near backing plate	32	33	20
Wheel Speed Sensor, RH Front	On RH front spindle	6	7	22
Wheel Speed Sensor RH Rear	In RH side of rear axle near backing plate	32	33	21
Windshield Washer Pump	In lower right side of windshield washer bottle	7	8	22
Windshield Wiper Motor	In engine compartment right of P/B booster, on bulkhead	10	11	42

Name	Location	201-Pg	Fig.	Conn.
Windshield Wiper Switch (Part Of Multifunction Switch)	Part of multifunction switch			
Connectors				
C101	Propulsion harness to body harness,	58	57	96
C102				
C103	Chassis harness to propulsion harness, near battery junction block			99
C104	Front body harness to chassis harness, near battery junction block			92
C105	Front body harness to propulsion harness, near P/B booster	12	13	100
C106	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield	12	13	108
C107	Front body harness to propulsion harness, near P/B booster	12	13	98
C109	Front body harness to inflatable restraint harness, near battery junction block	13	14	84
C111		21	22	93
C116	Near A/C compressor			85
C117	On right frame rail near PEB			86
C200	Propulsion harness to IP harness, behind RH side of IP, above hush panel	55	56	87
C203	IP harness to Front body harness, behind RH side of IP, above hush panel	55	56	111
C204	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	89
C205	Dome lamp harness to Front body harness, behind LH side of IP beneath IP speaker	50	51	102
C207	Front body harness to seat belt switch extension, under driver's seat			97
C211	Front body harness to steering column harness, LH side of IP, above knee bolster	39	40	105
C213	Propulsion harness to IP harness,			90
C214	Radio Harness to crossbody harness, behind center of IP	39	40	88
C300	Chassis harness to battery pack control module harness, under cab on left side of vehicle, above shield			109
C301	Chassis harness to rear axle speed sensor harness, on crossmember above rear axle	32	33	94
C400	Tail and stoplamps harness to chassis harness, under vehicle, at left rear of frame	66	67	95
C500	Crossbody harness to front door harness, behind door panel above speaker			103
C600	Crossbody harness to front door harness, behind door panel above speaker	63	64	104

ELECTRICAL COMPONENT LOCATION TABLE

Name	Location	201-Pg	Fig.	Conn.
Diodes				
D100	Front body harness 6.5 cm right of blower motor break out			
D101	Front body harness 17.5 cm left of blower motor relay break out			
D102	In ground sense harness connected to A/C compressor			
D103	In ground sense harness connected to power steering pump motor			
Grommets				
P100	Below brake master cylinder at bulkhead	25	26	
P500	Between Front Door and Cab	51	52	
P600	Between Front Door and Cab	51	52	
Grounds				
G100	Left front of vehicle mounted to radiator core support by LH headlamp	4	5	
G101	At Power Steering Pump	4	5	
G102	On right front of vehicle, mounted to radiator core support, by RH headlamp	4	5	
G103	On top of RH frame rail, near auxiliary battery	5	6	
G104	On top of RH frame rail, near auxiliary battery	5	6	
G105	On top of LH frame rail, near windshield washer bottle			
G106	On top of LH frame rail, near windshield washer bottle	6	7	
G110	Drive Motor Unit to Frame under center of engine compartment	0	0	
G111	On LH frame rail near APM	2	3	
G112	Behind RH side of core support near auxiliary battery	62	63	
G113	On RH frame rail, near auxiliary battery	1	2	
G114	MOunted to A/C compressor	26	27	
G115	Mounted to Power Steering Pump Motor			
G119	Between motor and right frame rail			
G120	Between hood and bulkhead			
G201	On power steering pump bracket	57	58	
G202	Left middle of vehicle on top of frame above front leaf spring mount	57	58	
G203	Left rear of vehicle on frame	63	64	
G204	On power steering pump bracket	63	64	
G205	Left middle of vehicle on top of frame above front leaf spring mount	63	64	
G206	Left rear of vehicle on frame			
G300	Left middle of vehicle on top of frame above front leaf spring mount			
G400	Right rear of vehicle on frame			
G401	Left rear of vehicle on frame			

Name	Location	201-Pg	Fig.	Conn.
Resistors				
R100	In ground sense harness connected to A/C compressor			
R101	In ground sense harness connected to power steering pump motor			
Splices				
S106	Propulsion harness, approximately 25 cm left of power steering pump breakout			
S107	Propulsion harness, approximately 5 cm left of inverter module breakout			
S109	Propulsion harness, approximately 10 cm left of power steering pump breakout			
S110	Propulsion harness, approximately 15 cm left of inverter module breakout			
S112	Propulsion harness, on D100			
S113	Propulsion harness, on D100			
S123	Propulsion harness, on D101			
S124	Propulsion harness, on D101			
S125	Front body harness 20cm right of brake vacuum booster at top of bulkhead			
S128	Front body harness, approximately 16 cm from jump start block eyelet			
S134	Drive unit harness, approximately 6 cm right of C113 breakout			
S135	Drive unit harness, approximately 12 cm right of C113 breakout			
S136	Drive unit harness, approximately 18 cm right of C113 breakout			
S138	Refrigerant valve jumper harness, approximately 15 cm right of refrigerant reversing valve breakout.			
S139	Refrigerant valve jumper harness, approximately 22.5 cm right of refrigerant reversing valve breakout.			
S137	Drive unit harness, approximately 24 cm right of C113 breakout			
S152	Propulsion harness, approximately 32 cm right of power inverter module—C1 breakout			
S205	0			
S216	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S217	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S218	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			
S219	Front body harness, approximately 4 cm left of outside air valve actuator motor breakout			

ELECTRICAL COMPONENT LOCATION TABLE

Name	Location	201-Pg	Fig.	Conn.
S223	In I/P harness run channel between I/P fuse block and C204 (body harness), 8cm from C204			
S224	In I/P harness run channel between I/P fuse block and C204 (body harness), 12cm from C204			
S225	In I/P harness run channel 13cm from TBC connector toward center I/P breakout	41	42	
S226	In I/P harness run channel 8 cm from center I/P breakout toward TBC	41	42	
S227	In I/P harness run channel 4 cm from courtesy lamp body harness inline connector breakout	41	42	
S228		41	42	
S235	In I/P harness 4cm from run channel in HVAC control harness breakout	41	42	
Splice Packs				
SP100	Left front of vehicle mounted to radiator support			
SP101	Right front of vehicle mounted to radiator support	62	63	
SP200	Behind IP cluster			
SP201	Behind IP cluster			
SP202	Behind IP cluster			
SP203	In I/P harness 12.5 cm from run channel at HVAC control harness breakout			
SP204	Behind left hand kick panel near front of drivers door.	63	64	
SP400	Mounted to left rear frame rail	52	53	
SP401	Mounted to left rear frame rail	66	67	
SP402	Mounted to right rear frame rail	66	67	

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COMPONENT LOCATION VIEWS

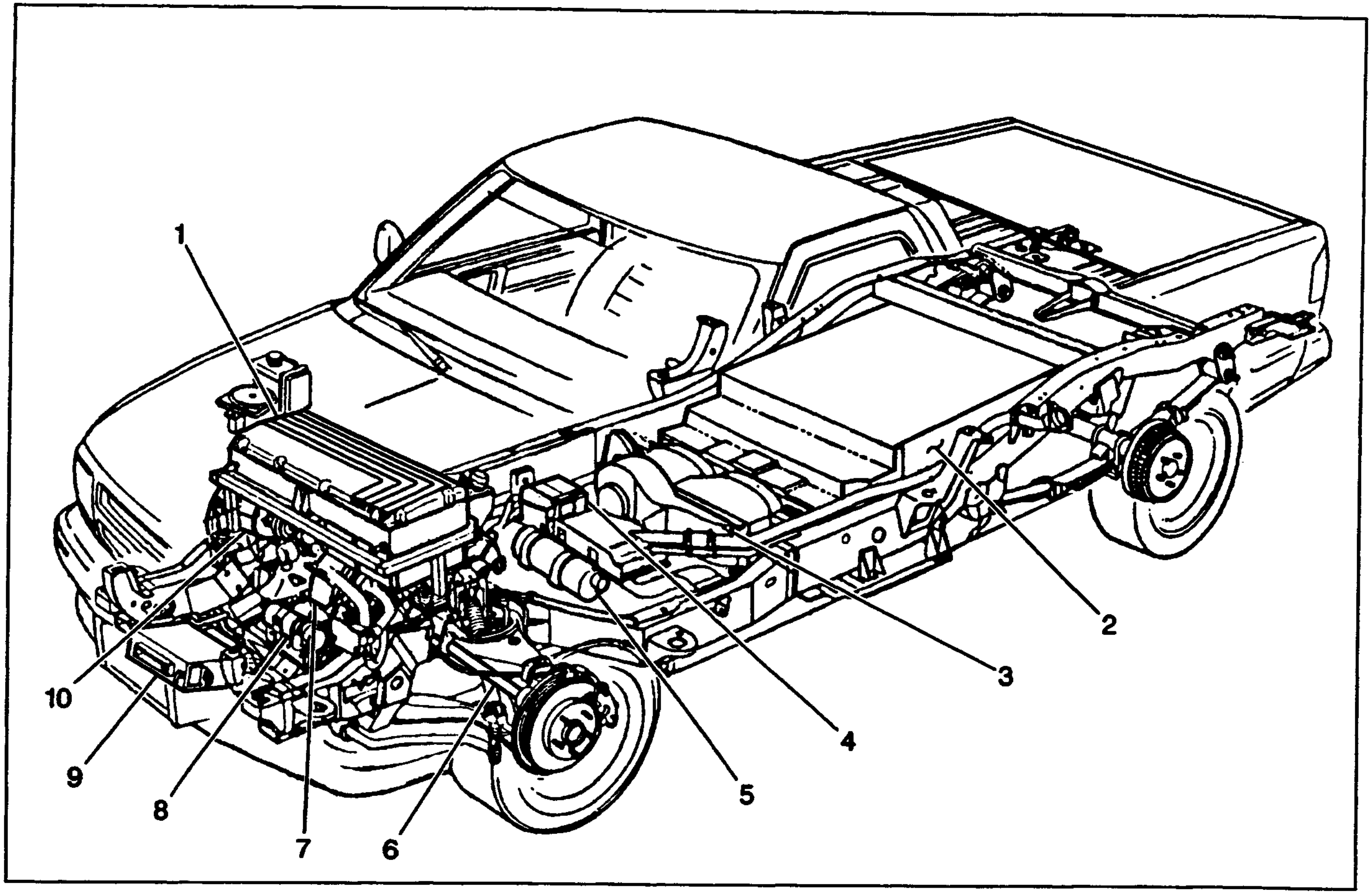


Figure 1

Legend

(1) Power Electronics Bay (PEB)
(2) Drive Motor Battery Assembly
(3) Battery Thermal Module
(4) Auxiliary Heater Assembly
(5) P/B Booster Vacuum Switch
(6) Front Drive Shaft
(7) Drive Motor Assembly
(8) Coolant Pump
(9) Charge Receptacle
(10) Power Steering Pump Motor

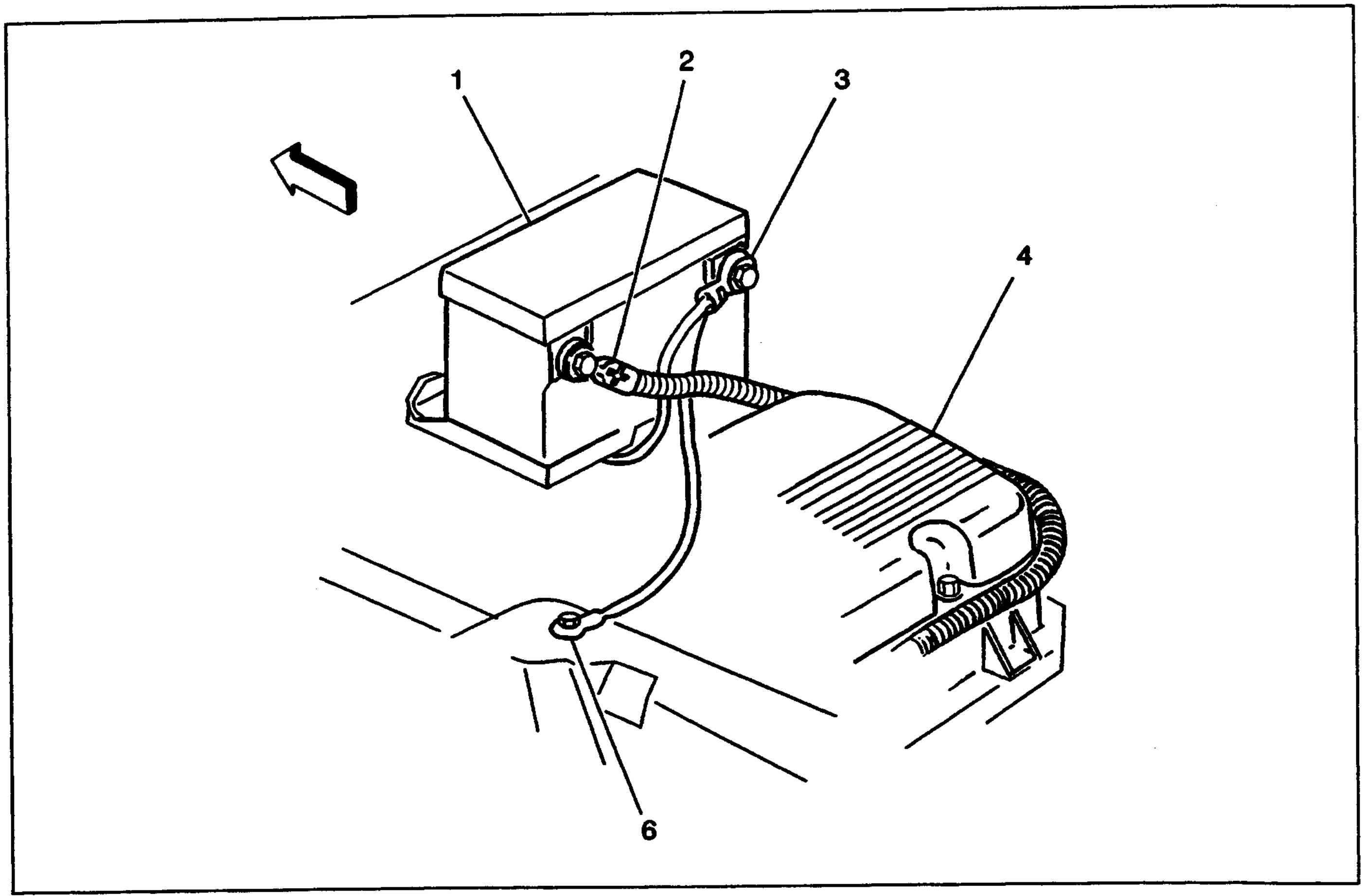


Figure 2

Legend

- (1) Auxiliary Battery
- (2) Auxiliary Battery Positive Cable
- (3) Auxiliary Battery Negative Cable
- (4) Power Electronics Bay (PEB)
- (6) G113

COMPONENT LOCATION VIEWS

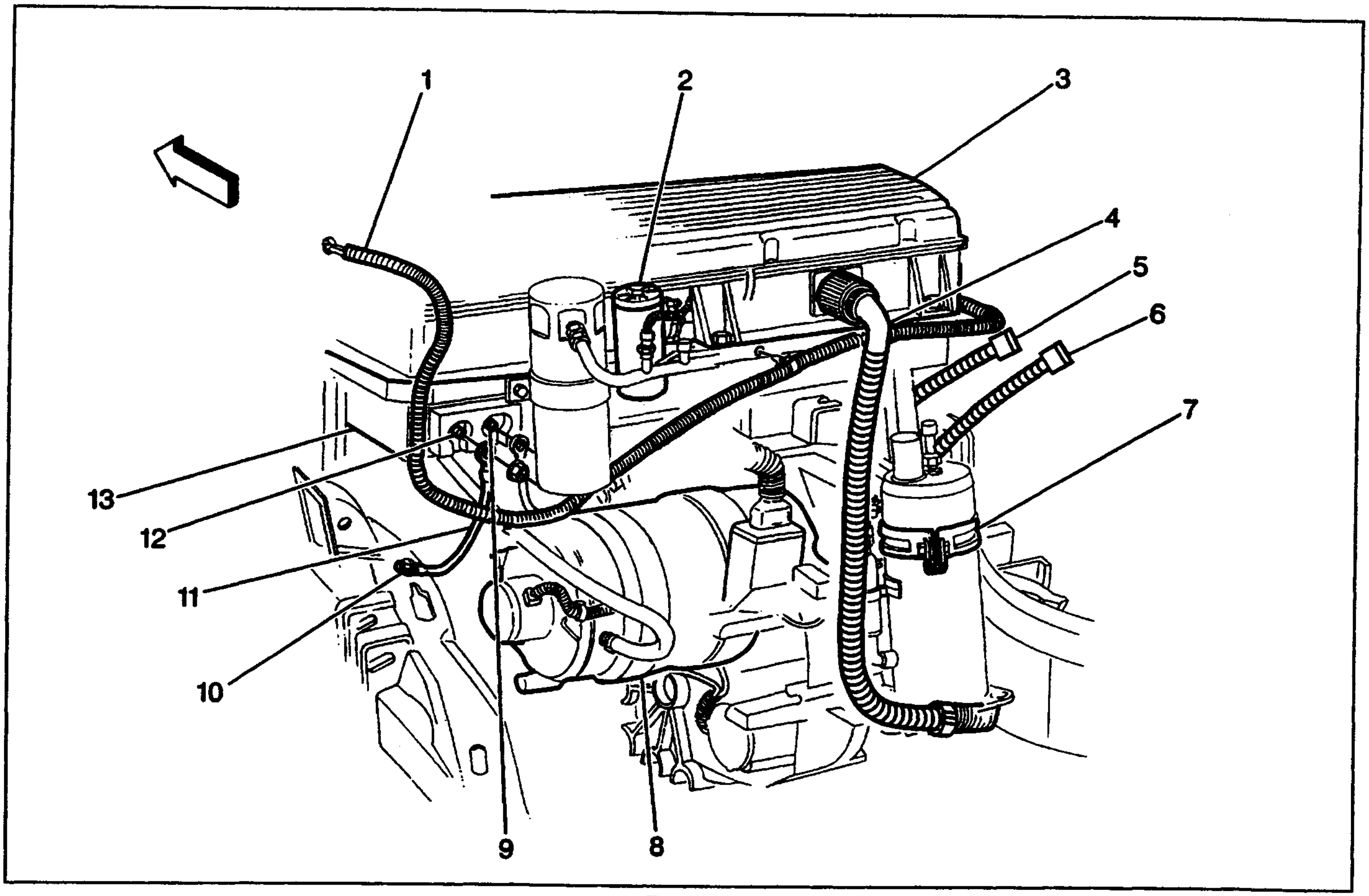


Figure 3

Legend

(1) Auxiliary Battery Positive Cable and Accessory Power Control Module (APM) Positive Cable
(2) P/B Booster Vacuum Pump
(3) Power Electronics Bay (PEB)
(4) Battery Pack High Voltage Cable
(5) C115
(6) C116
(7) A/C Compressor Motor
(8) Drive Motor Assembly
(9) Accessory Power Control Module (APM) Positive Terminal
(10) G111
(11) Accessory Power Control Module (APM) Negative Cable
(12) Accessory Power Control Module (APM) Negative Terminal
(13) Accessory Power Control Module (APM)

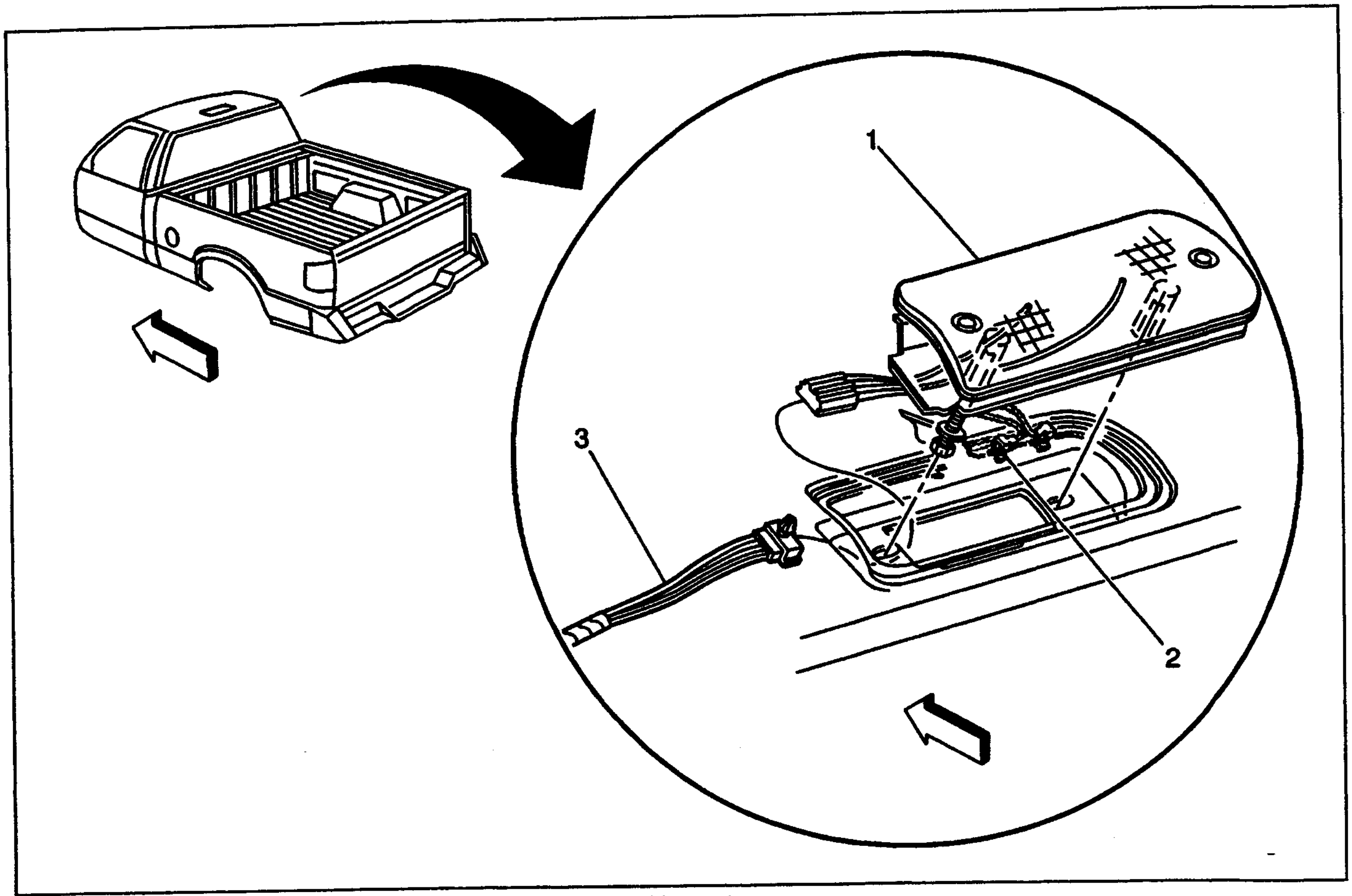


Figure 4

Legend

(1) Center High Mounted Stoplamp (CHMSL)
(2) Dome Lamp
(3) Dome Lamp Harness

COMPONENT LOCATION VIEWS

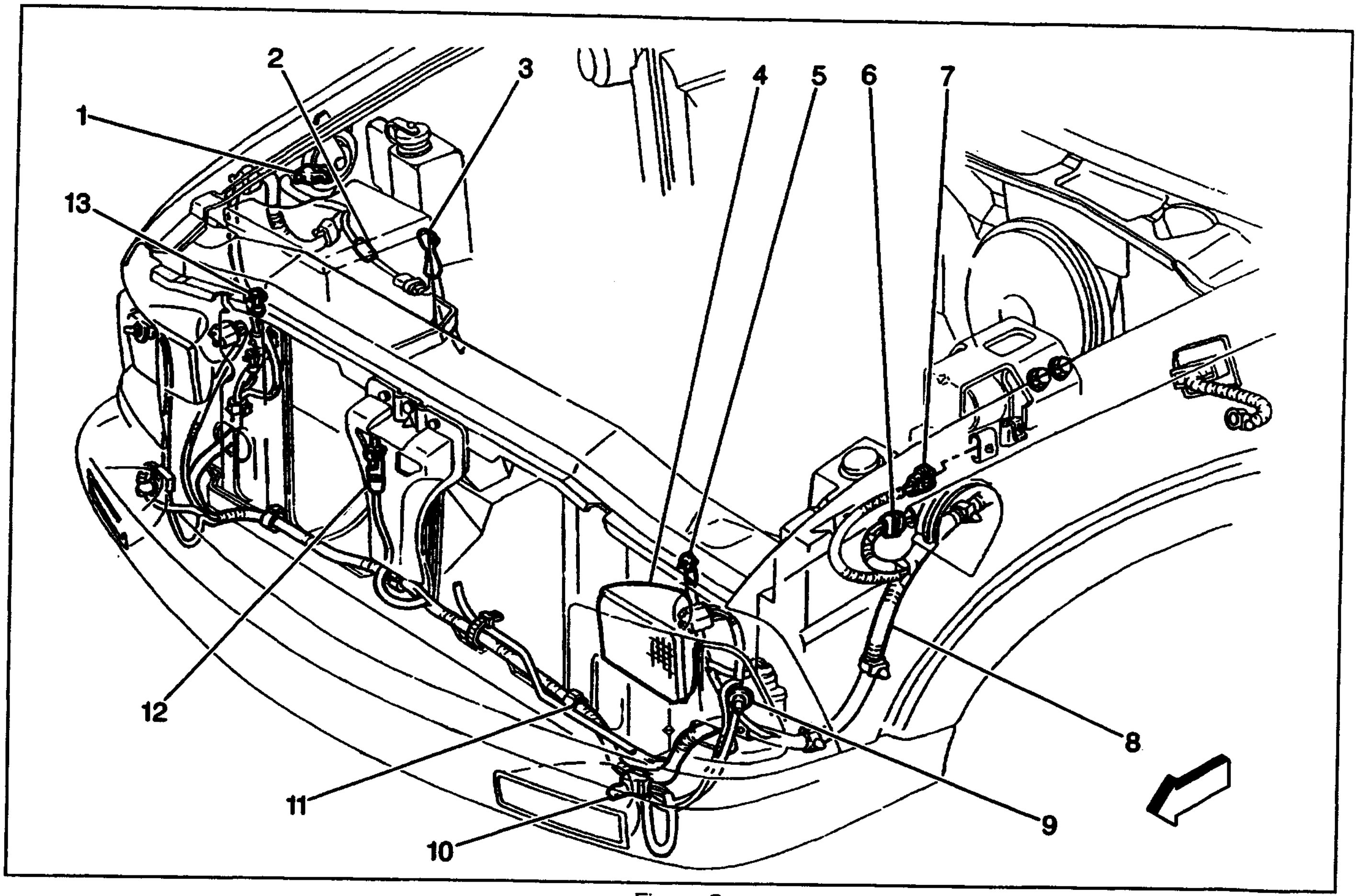


Figure 5

Legend

(1) Horn, RH
(2) Tape Bundle
(3) Auxiliary Battery Positive Cable
(4) Headlamp, LH-High/Low
(5) G102
(6) Horn, LH
(7) Electronic Brake Control Module (EBCM) - C2
(8) Forward Lamps Harness
(9) Side Marker Lamp, LH Front (RH similar)
(10) Turn Signal/Park Lamp, LH Front (RH similar)
(11) Clip, Convolute Conduit
(12) Ambient Air Temperature Sensor
(13) G100

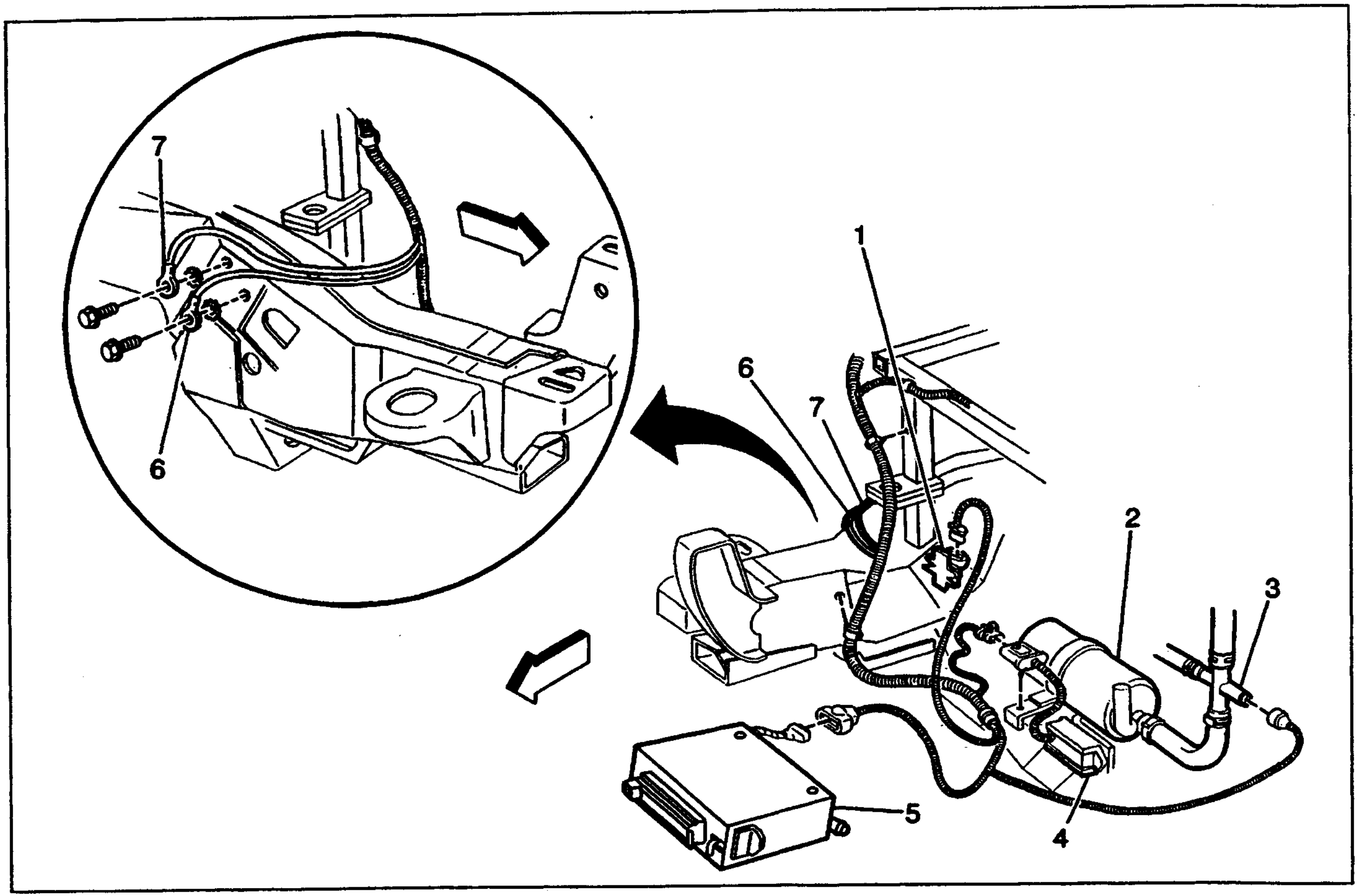


Figure 6

Legend

(1) Ambient Air Temperature Sensor
(2) Coolant Pump
(3) Coolant Temperature Sensor
(4) Coolant Pump Buffer
(5) Charge Receptacle
(6) G103
(7) G104

COMPONENT LOCATION VIEWS

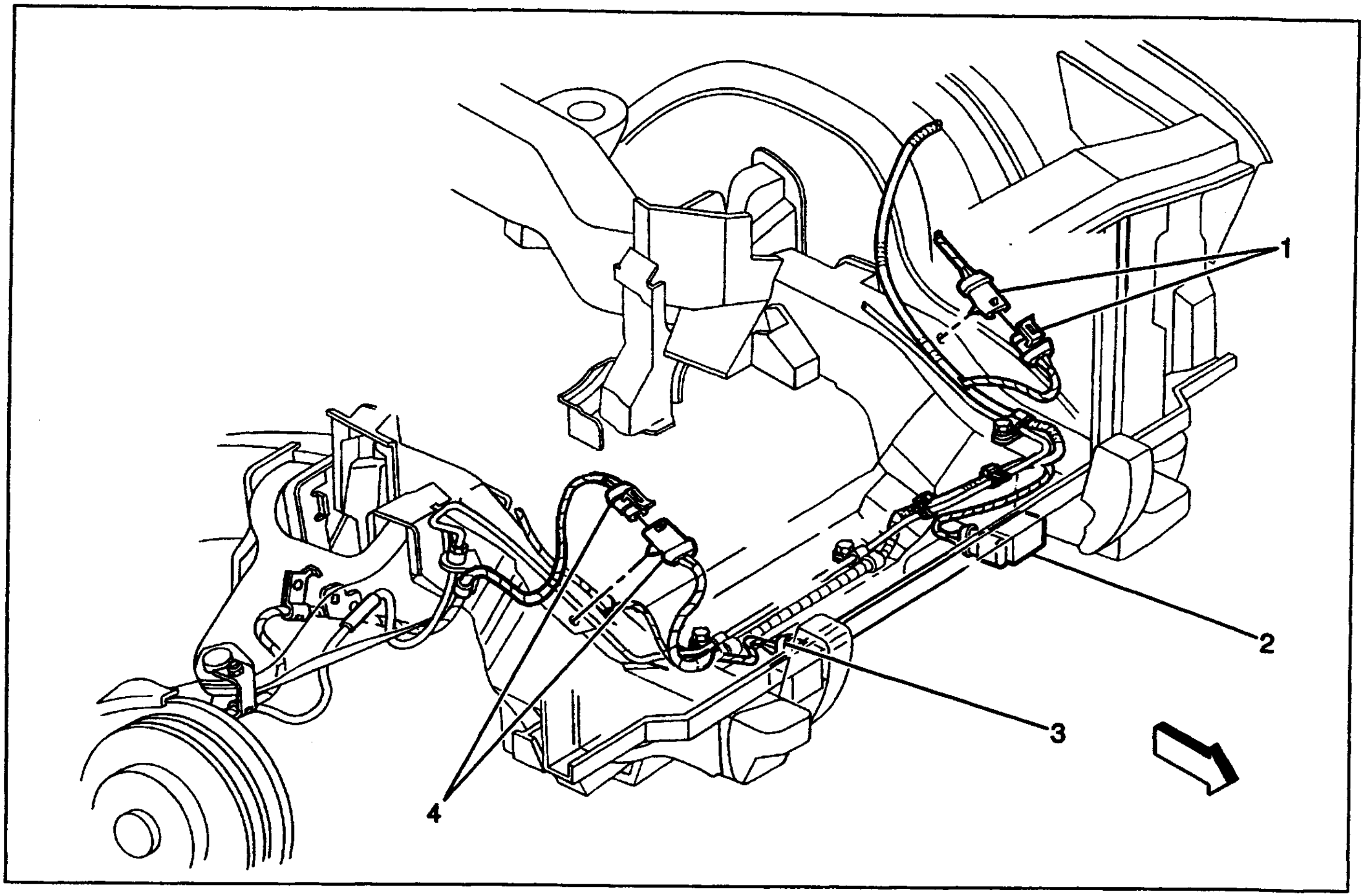


Figure 7

Legend

(1) Wheel Speed Sensor Connector, LH Front
(2) Supplemental Inflatable Restraint Discriminating Sensor, LH Front
(3) Supplemental Inflatable Restraint Discriminating Sensor, RH Front
(4) Wheel Speed Sensor Connector, RH Front

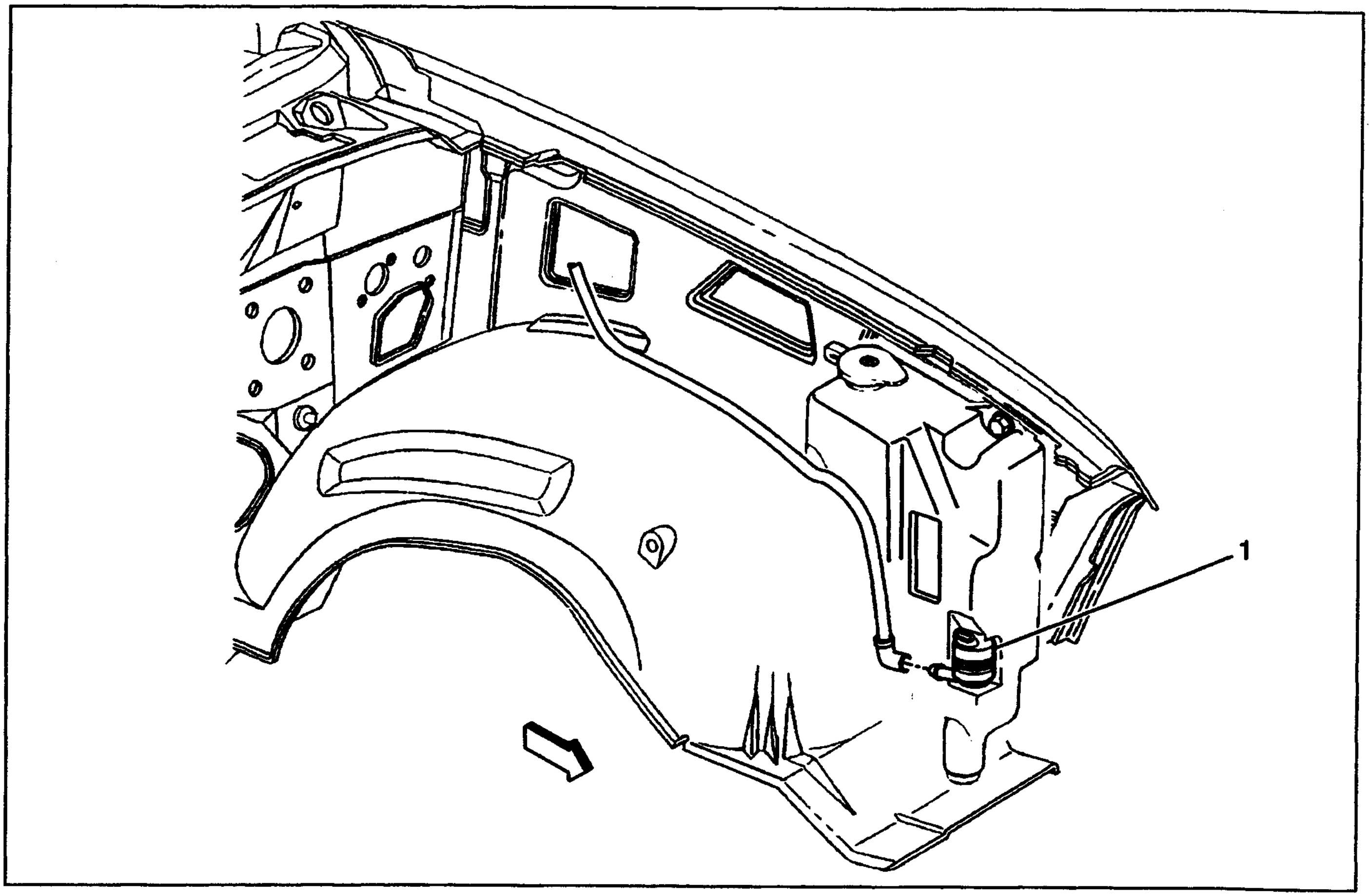


Figure 8

Legend

(1) Windshield Washer Pump

COMPONENT LOCATION VIEWS

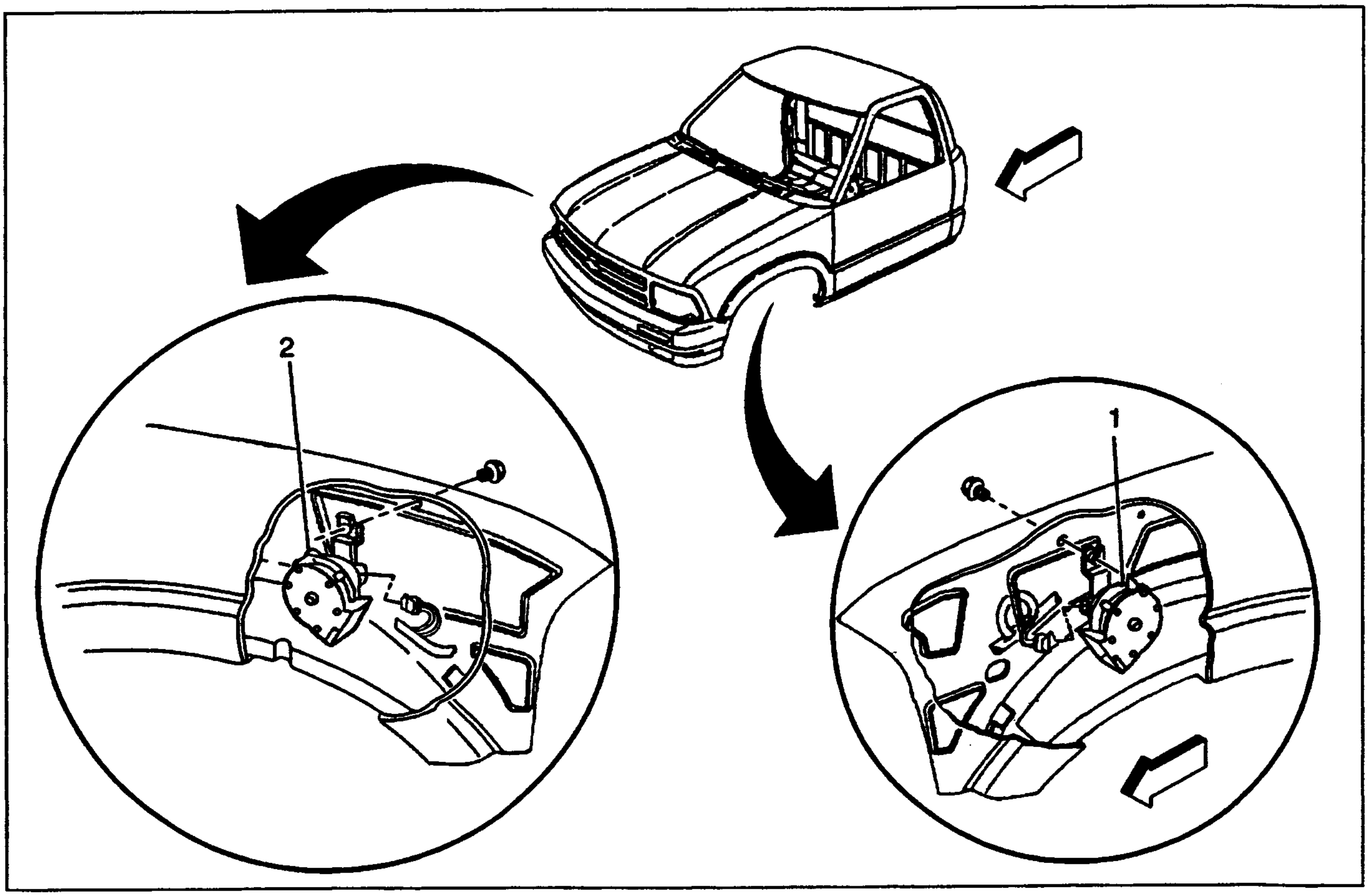


Figure 9

Legend

(1) Horn, LH

(2) Horn, RH

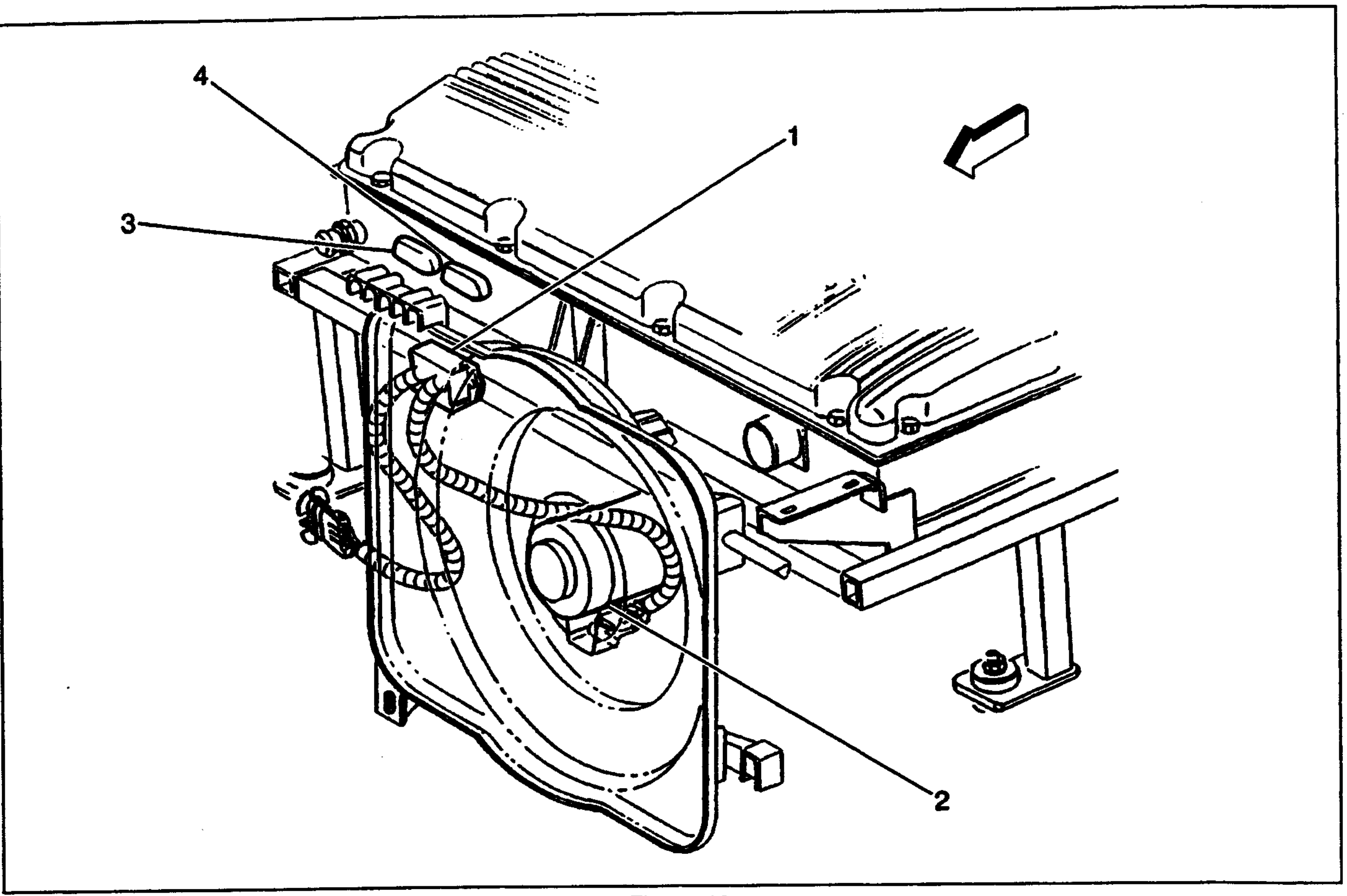


Figure 10

Legend

- (1) A/C Condenser Cooling Fan Buffer
- (2) A/C Condenser Cooling Fan Motor
- (3) Power Inverter Module - C1
- (4) Power Inverter Module - C2

COMPONENT LOCATION VIEWS

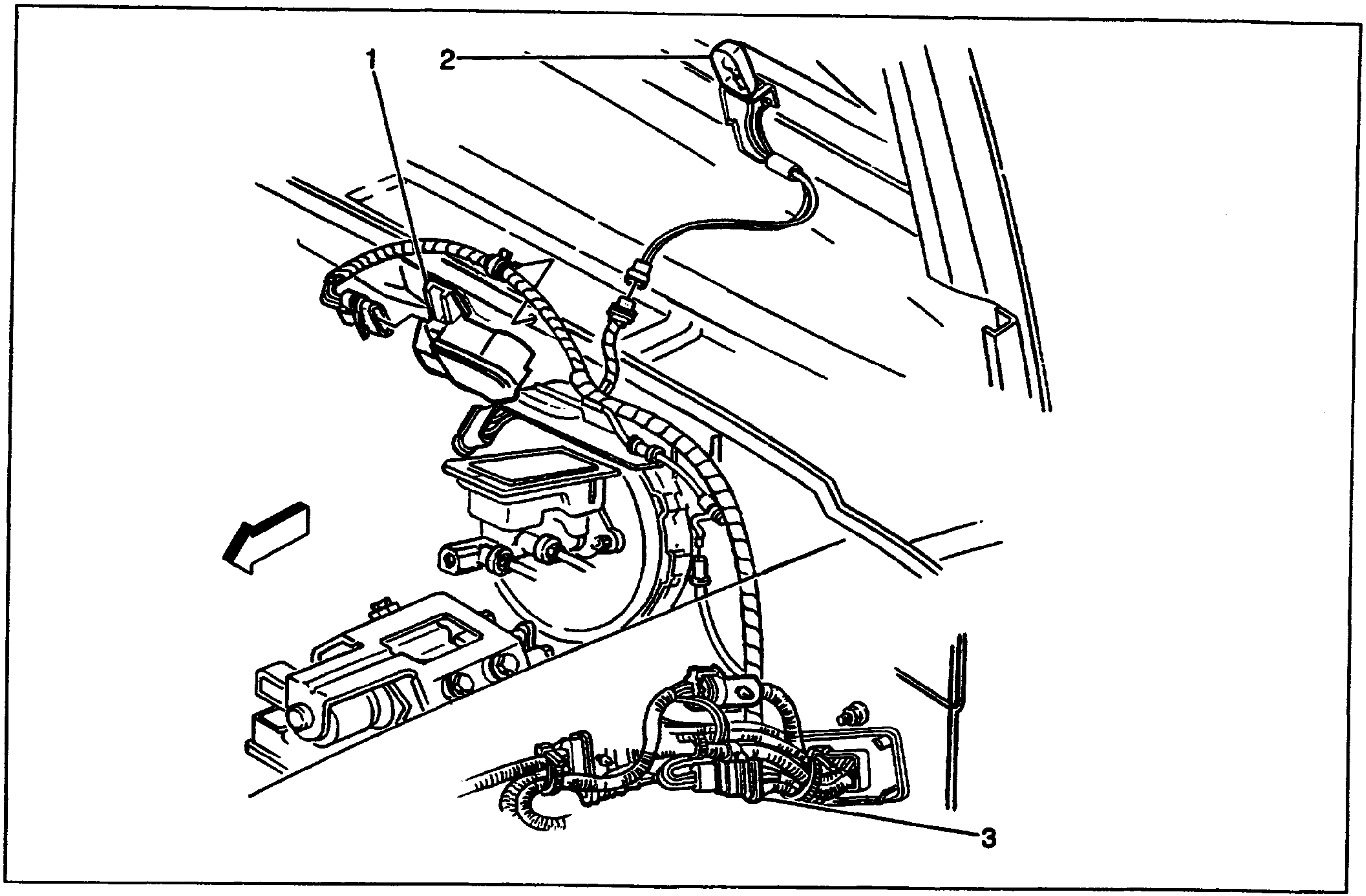


Figure 11

Legend

(1) Windshield Wiper Motor
(2) Underhood Lamp
(3) Electronic Brake Control Module (EBCM) - C2

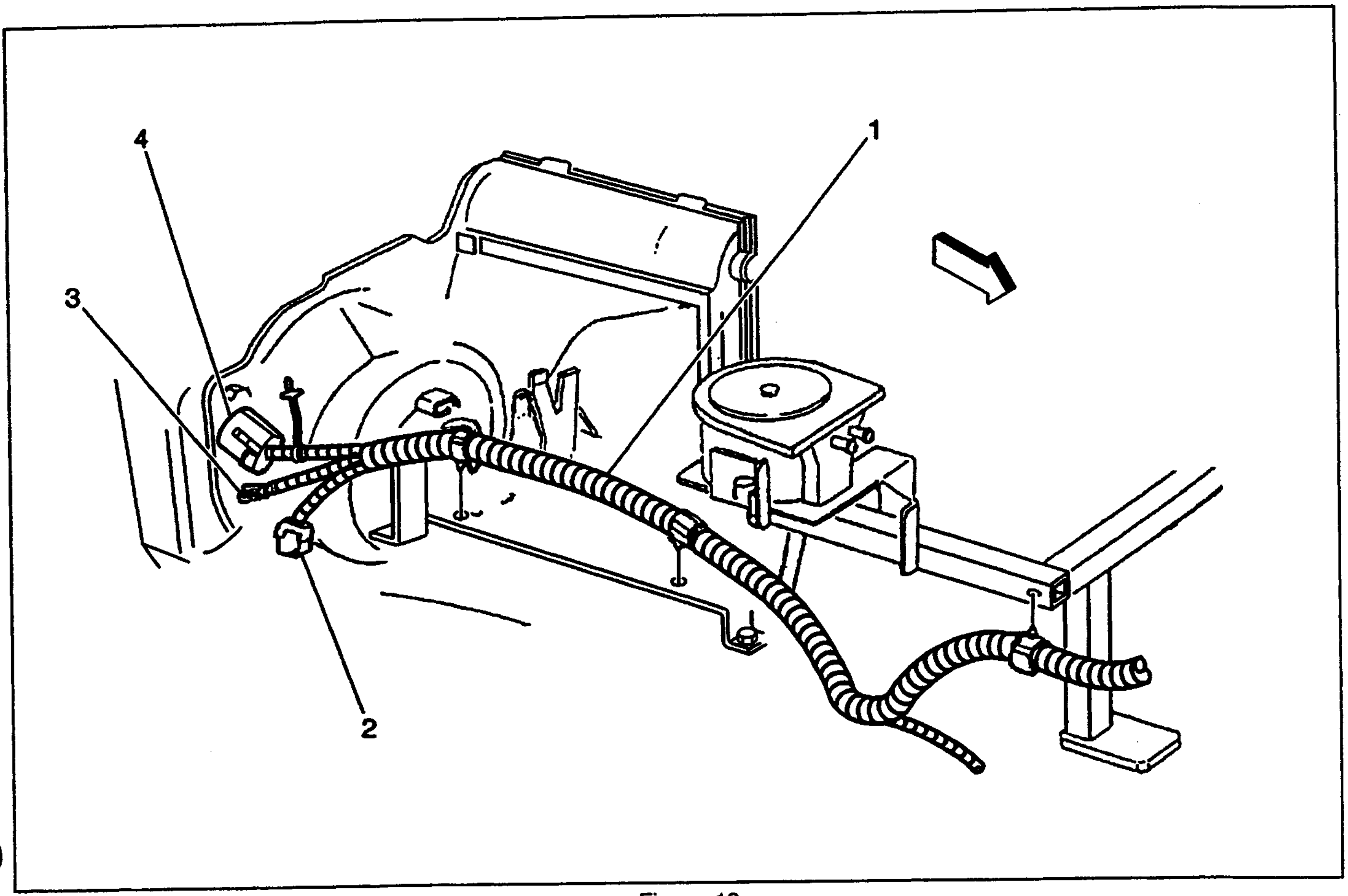


Figure 12

Legend

(1) Coolant Recovery Tank
(2) C105
(3) C107
(4) C106

COMPONENT LOCATION VIEWS

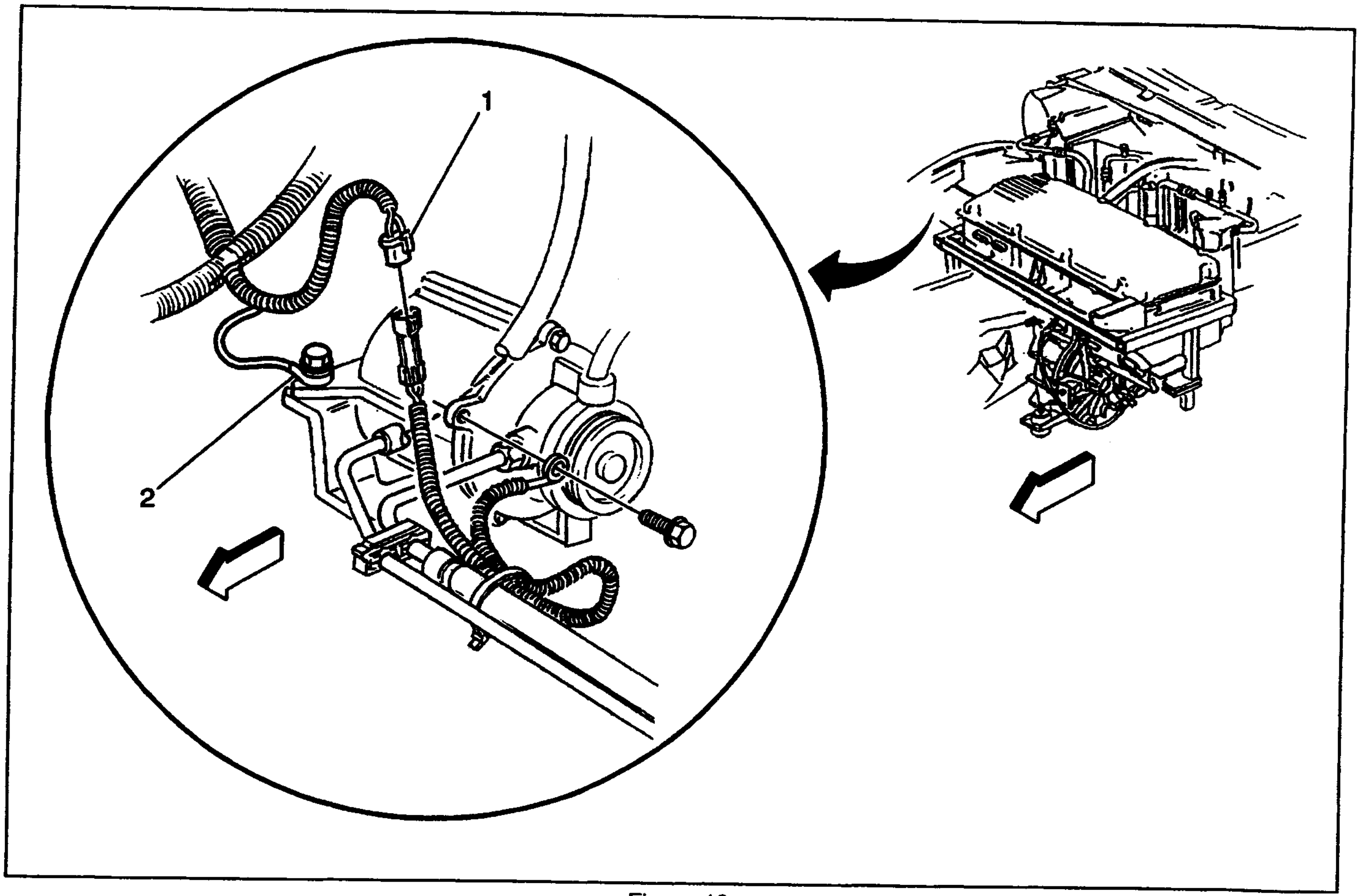


Figure 13

Legend

(1) C117

(2) G114

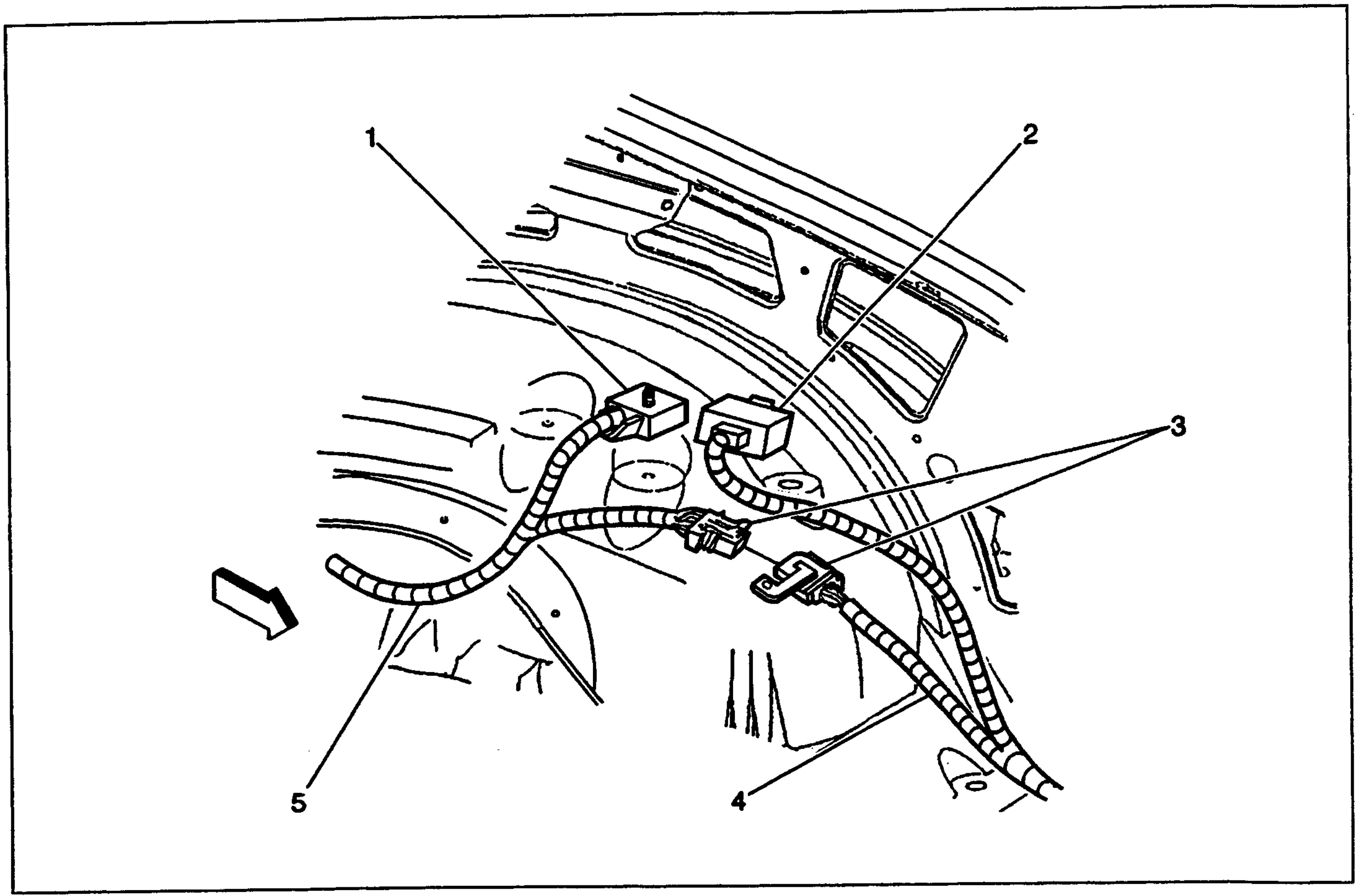


Figure 14

Legend

- (1) UBEC, C3
- (2) UBEC, C4
- (3) C101
- (4) Forward Lamp Harness
- (5) Chassis Harness

COMPONENT LOCATION VIEWS

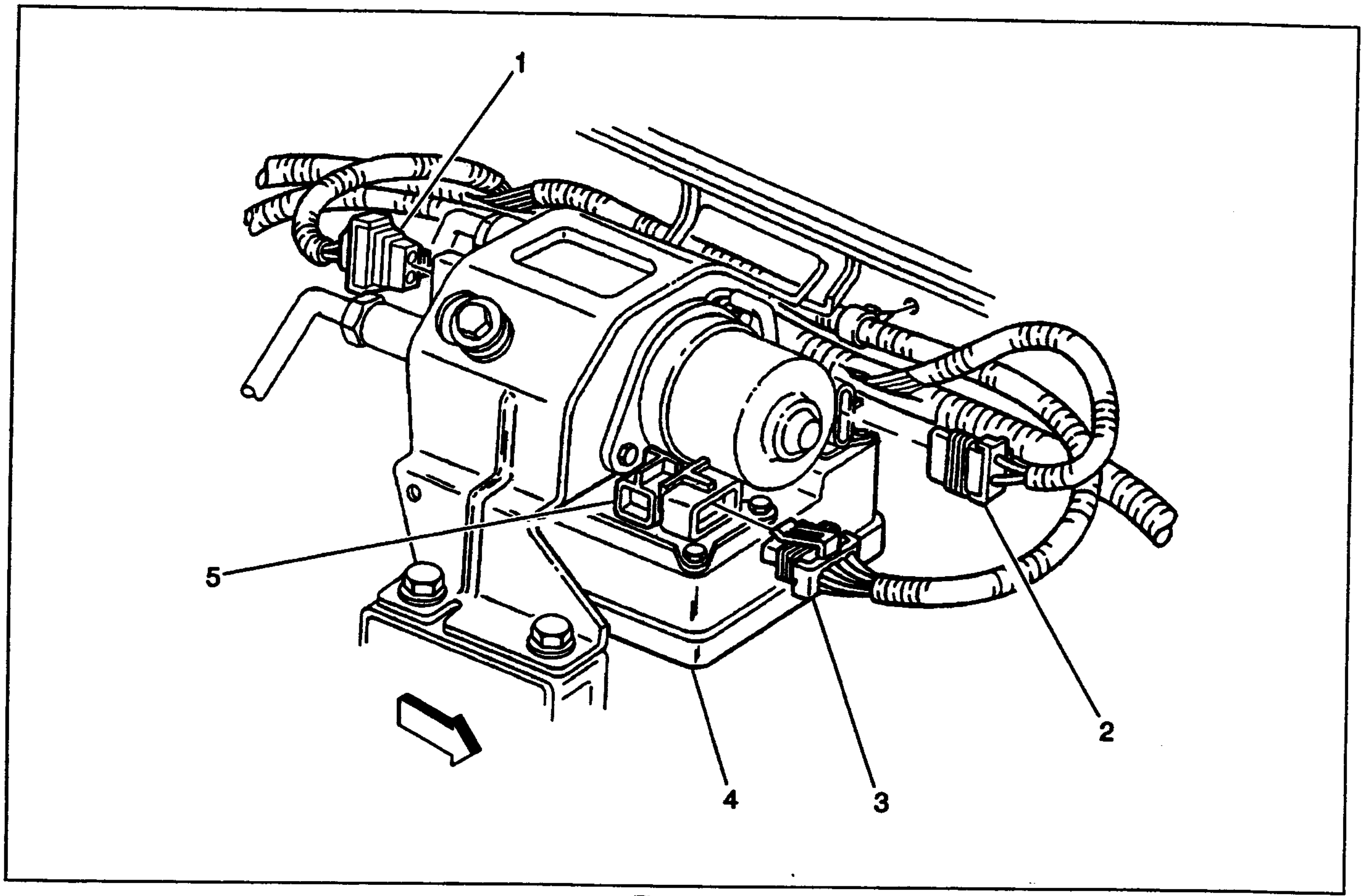


Figure 15

Legend

(1) Brake Pressure Warning Switch
(2) Electronic Brake Control Module (EBCM) - C2, From Forward Lamps Harness
(3) Electronic Brake Control Module (EBCM) - C1, From Front Of Dash Harness
(4) Electronic Brake Control Module
(5) Electronic Brake Control Module (EBCM) - C3, From Wheel Speed Sensor Harness

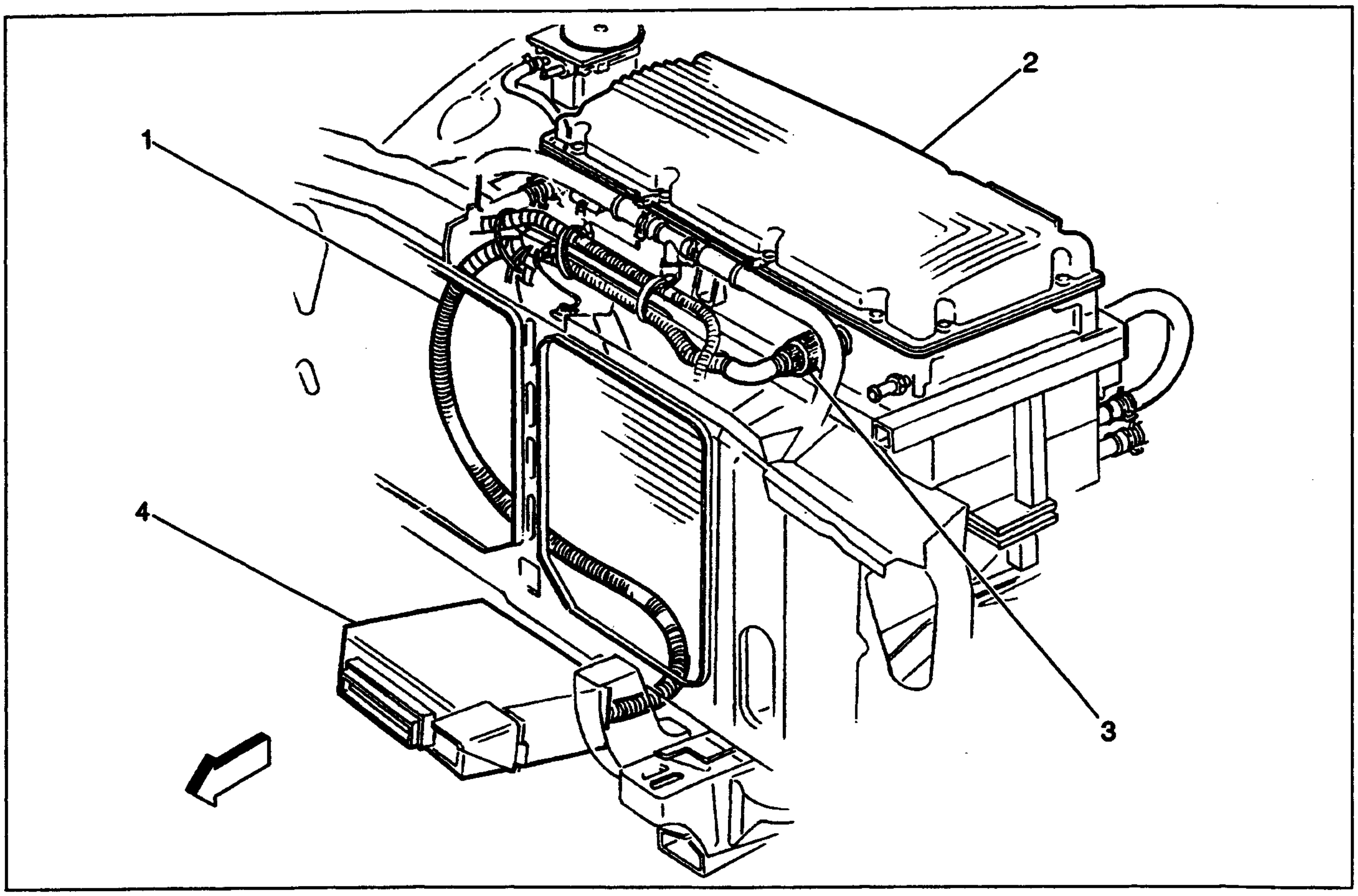


Figure 16

Legend

(1) Charge Receptacle High Voltage Cable
(2) Power Electronics Bay (PEB)
(3) Charge Receptacle High Voltage Cannon Connector
(4) Charge Receptacle

COMPONENT LOCATION VIEWS

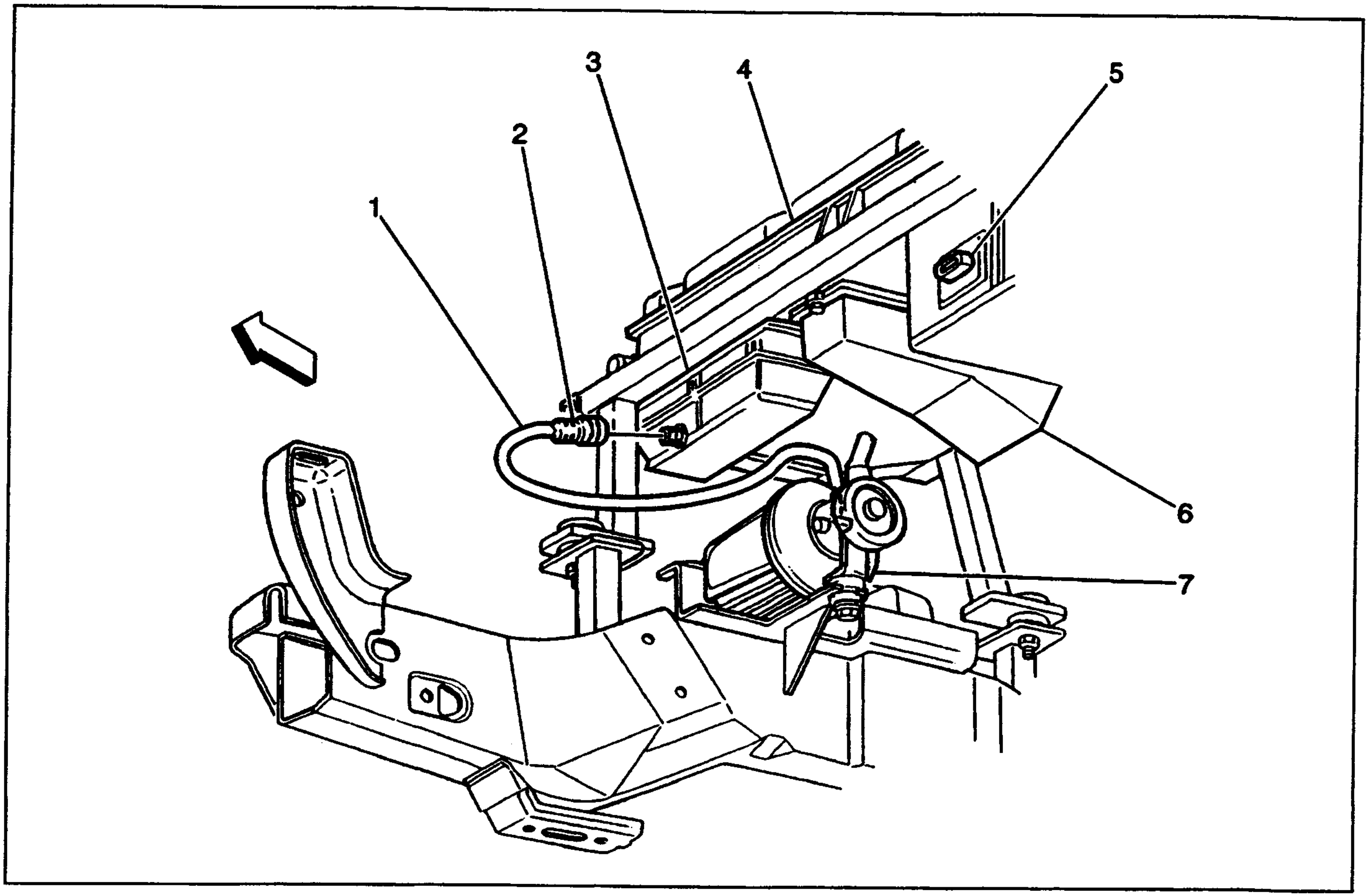


Figure 17

Legend

(1) Power Steering Control Module (PSCM) High Voltage Cable
(2) Power Steering Control Module (PSCM) High Voltage Cannon Connector
(3) Power Steering Control Module (PSCM)
(4) Power Electronics Bay (PEB)
(5) Accessory Power Control Module (APM) - C1
(6) Drive Motor Assembly Connector
(7) Power Steering Pump Motor

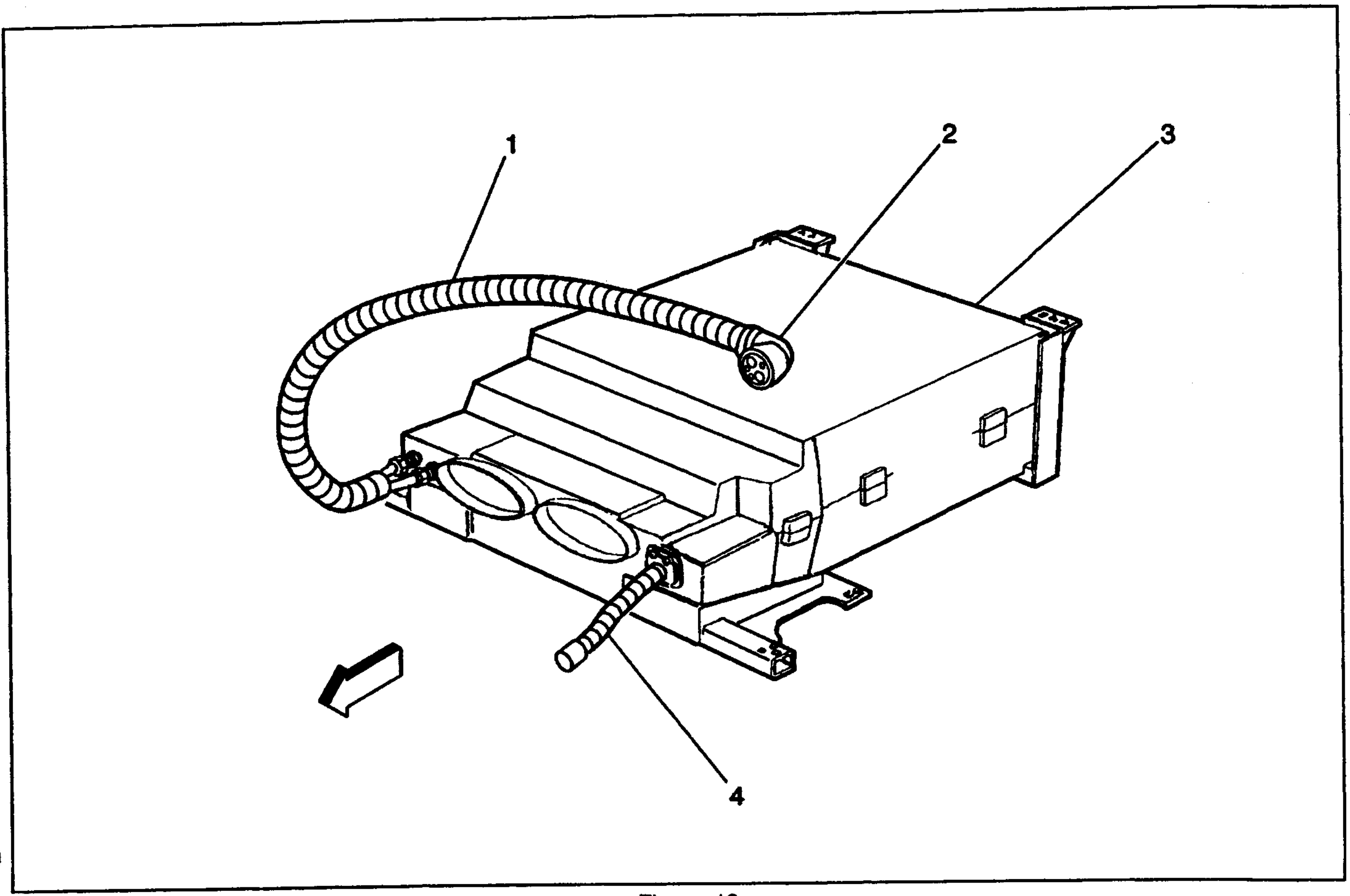


Figure 18

Legend

(1) Battery Pack High Voltage Cable
(2) Battery Pack High Voltage Cannon Connector
(3) Drive Motor Battery Pack Assembly
(4) Battery Pack Control Module - C1

COMPONENT LOCATION VIEWS

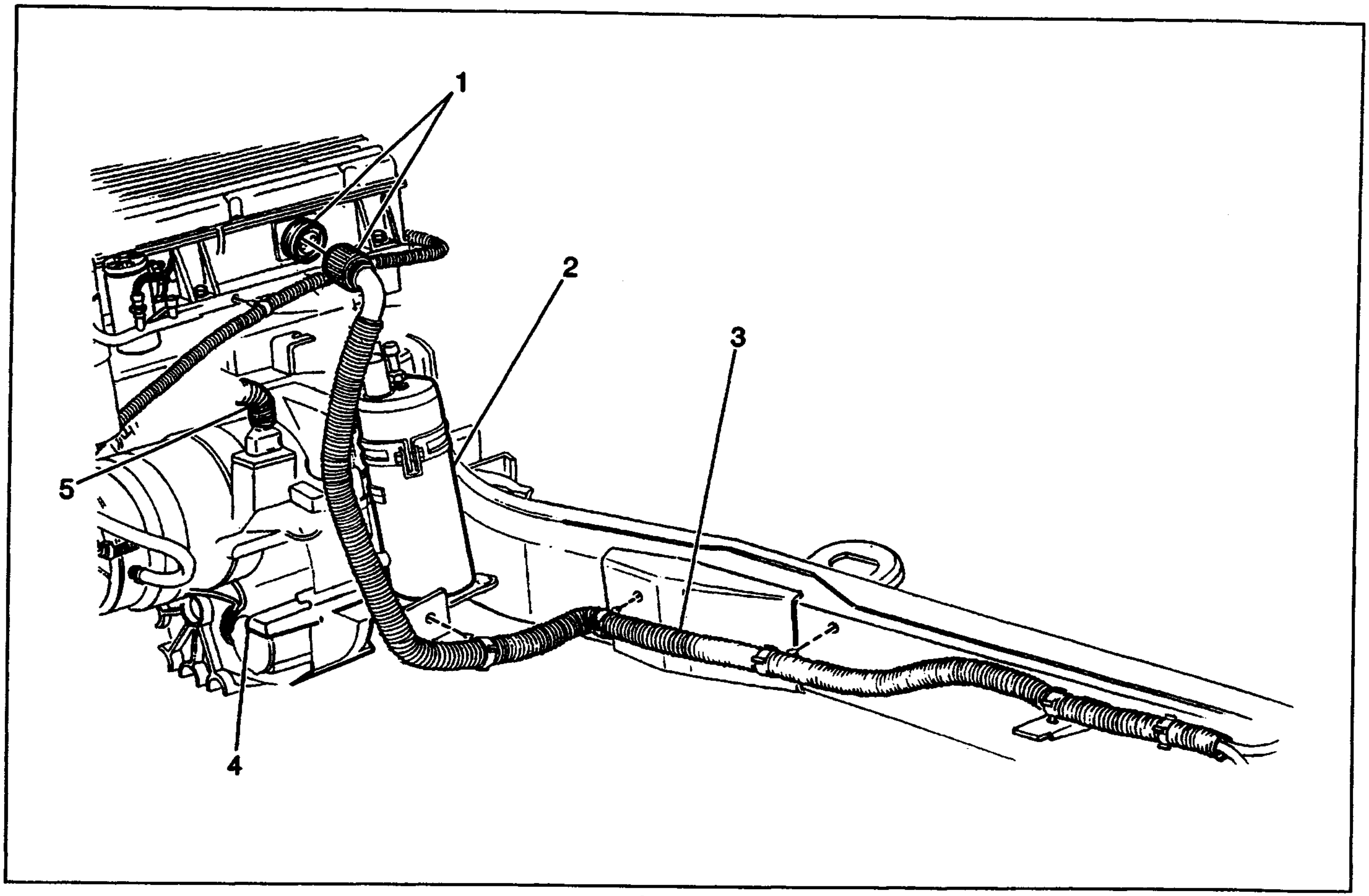


Figure 19

Legend

(1) Battery Pack High Voltage Cannon Connector
(2) A/C Compressor
(3) Battery Pack High Voltage Cable
(4) Drive Motor Assembly
(5) Drive Motor Assembly High Voltage Cable

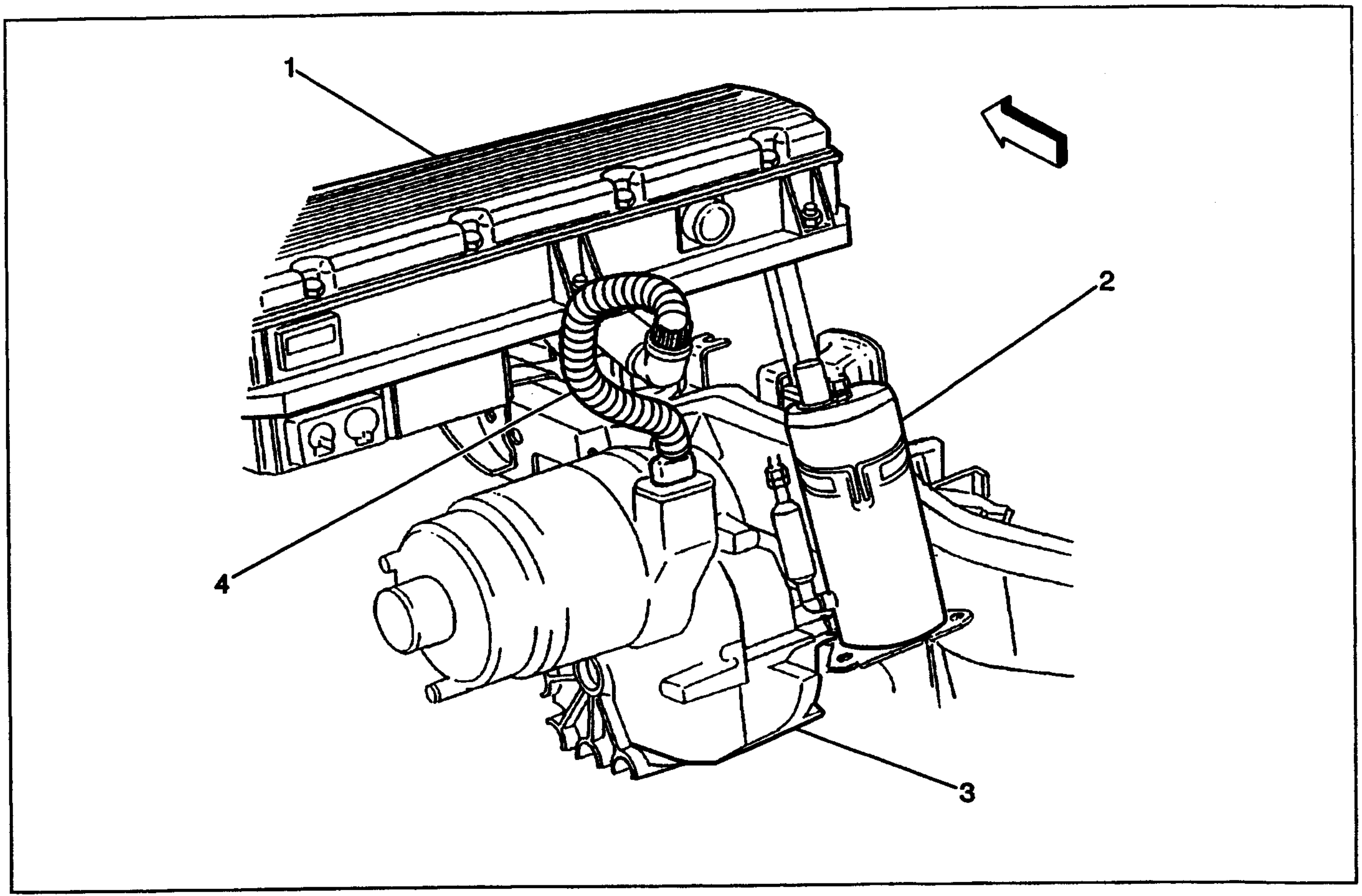


Figure 20

Legend

(1) Power Electronics Bay (PEB)
(2) A/C Compressor Motor
(3) Drive Motor Assembly
(4) Drive Motor High Voltage Cable

COMPONENT LOCATION VIEWS

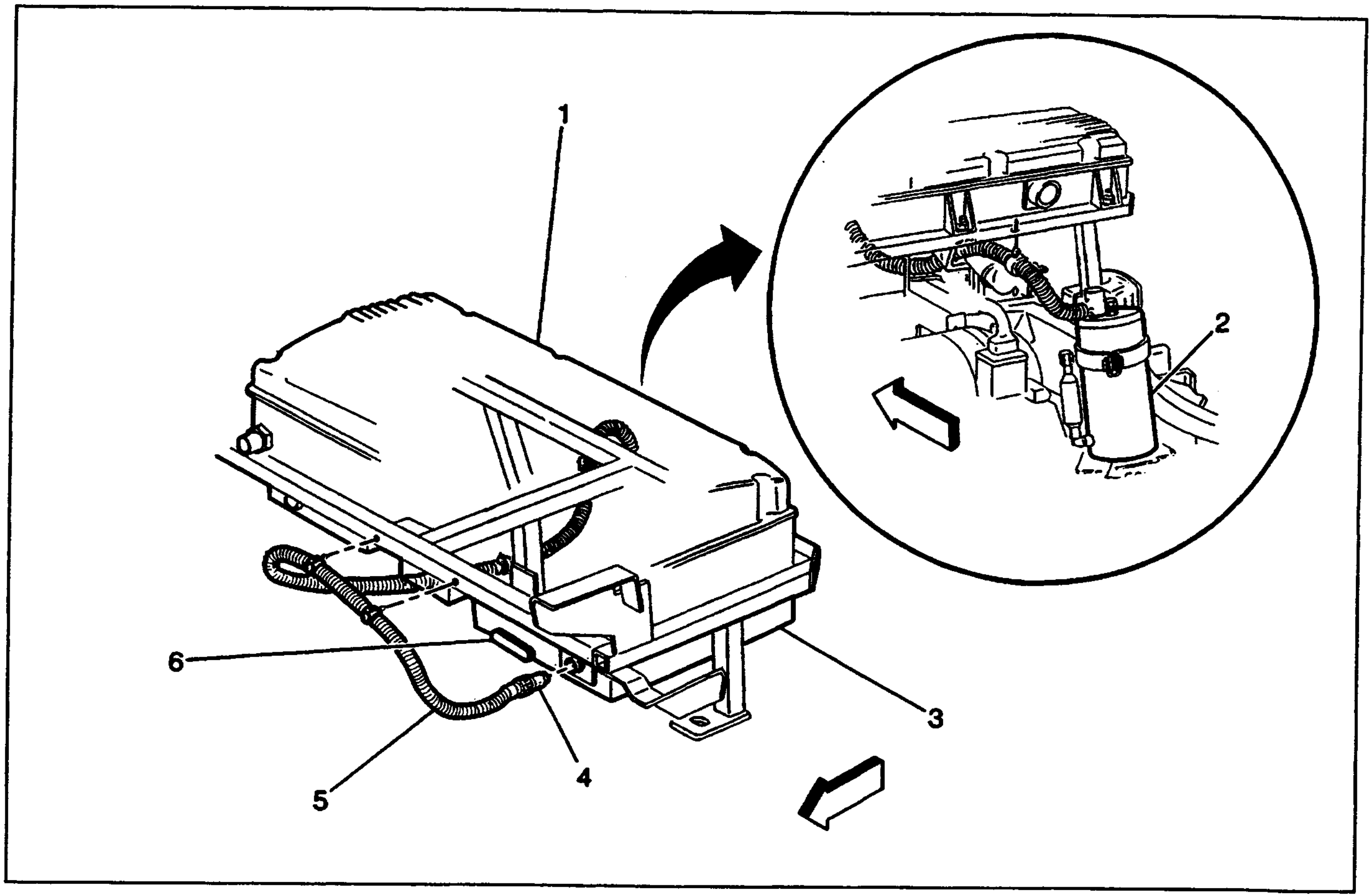


Figure 21

Legend

(1) Power Electronics Bay (PEB)
(2) A/C Compressor Motor
(3) Accessory Power Control Module (APM)
(4) A/C Compressor High Voltage Cable Cannon Connector
(5) A/C Compressor High Voltage Cable
(6) Accessory Power Control Module (APM) - C2

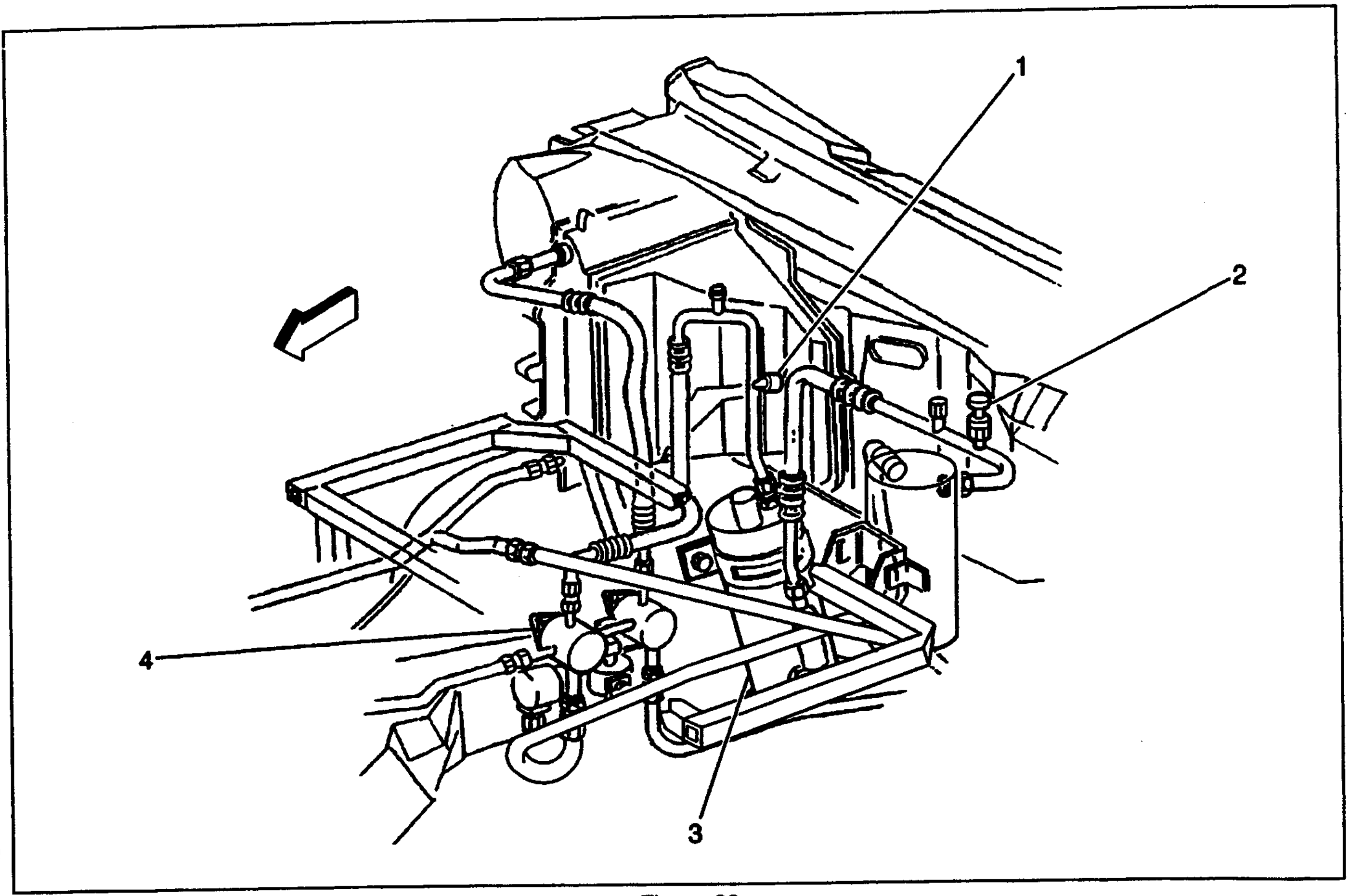


Figure 22

Legend

(1) A/C High Pressure Sensor
(2) A/C Low Pressure Sensor
(3) A/C Compressor Motor
(4) Refrigerant Reversing Valve

COMPONENT LOCATION VIEWS

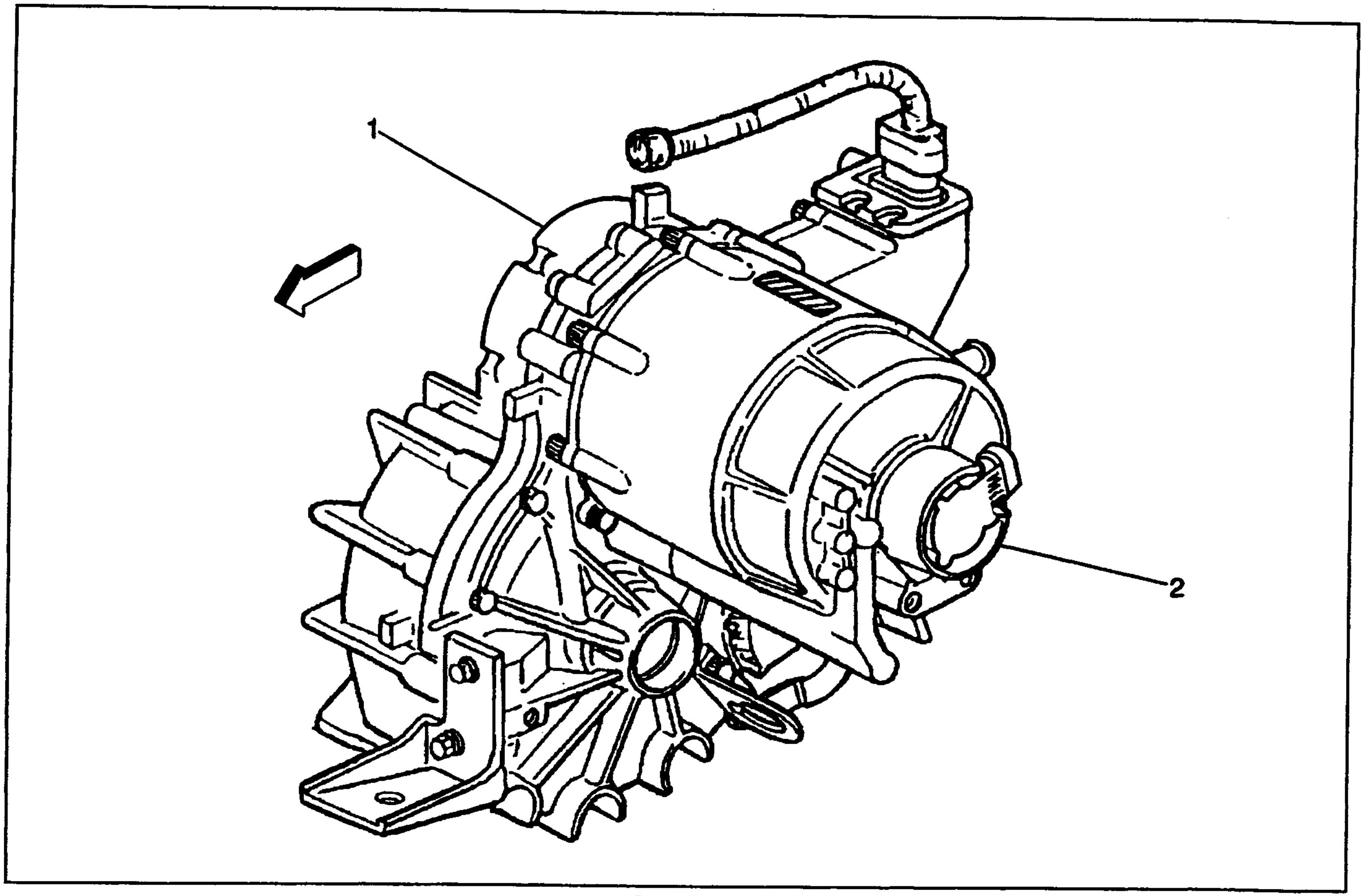


Figure 23

Legend

(1) Drive Motor Assembly

(2) Drive Motor Speed And Direction Sensor (Encoder)

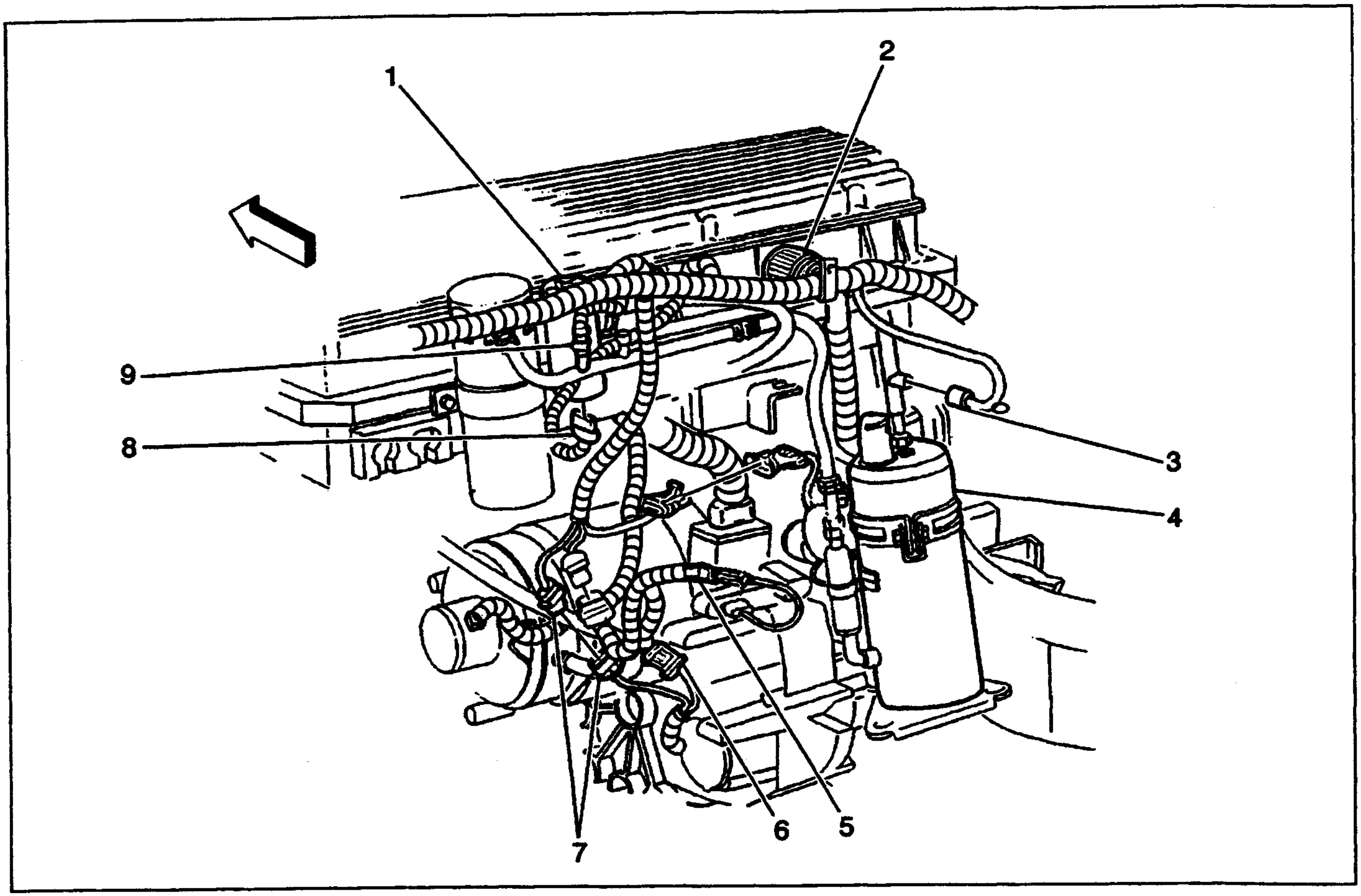


Figure 24

Legend

(1) P/B Booster Vacuum Pump
(2) Battery Pack High Voltage Connector
(3) A/C High Pressure Sensor
(4) A/C Compressor Motor
(5) Motor Winding Temperature Sensor
(6) Transmission Range Indicator Switch - C1
(7) Transmission Range Indicator Switch - C2
(8) P/B Booster Vacuum Pump Connector
(9) A/C Low Pressure Sensor

COMPONENT LOCATION VIEWS

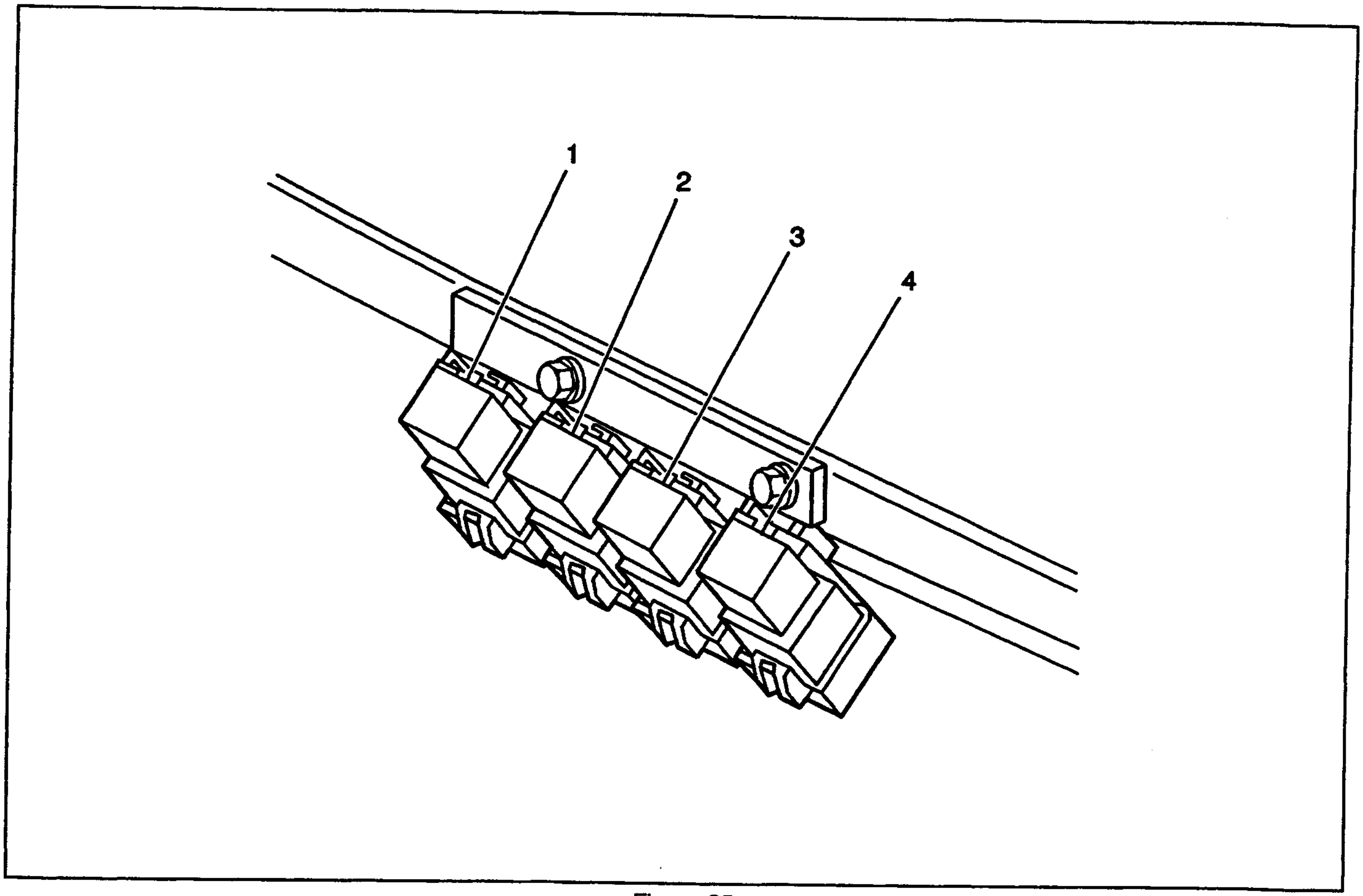


Figure 25

Legend

- (1) Battery Valve Primary Relay
- (2) Blower Motor Relay
- (3) Battery Valve Secondary Relay
- (4) Auxiliary Heater Relay

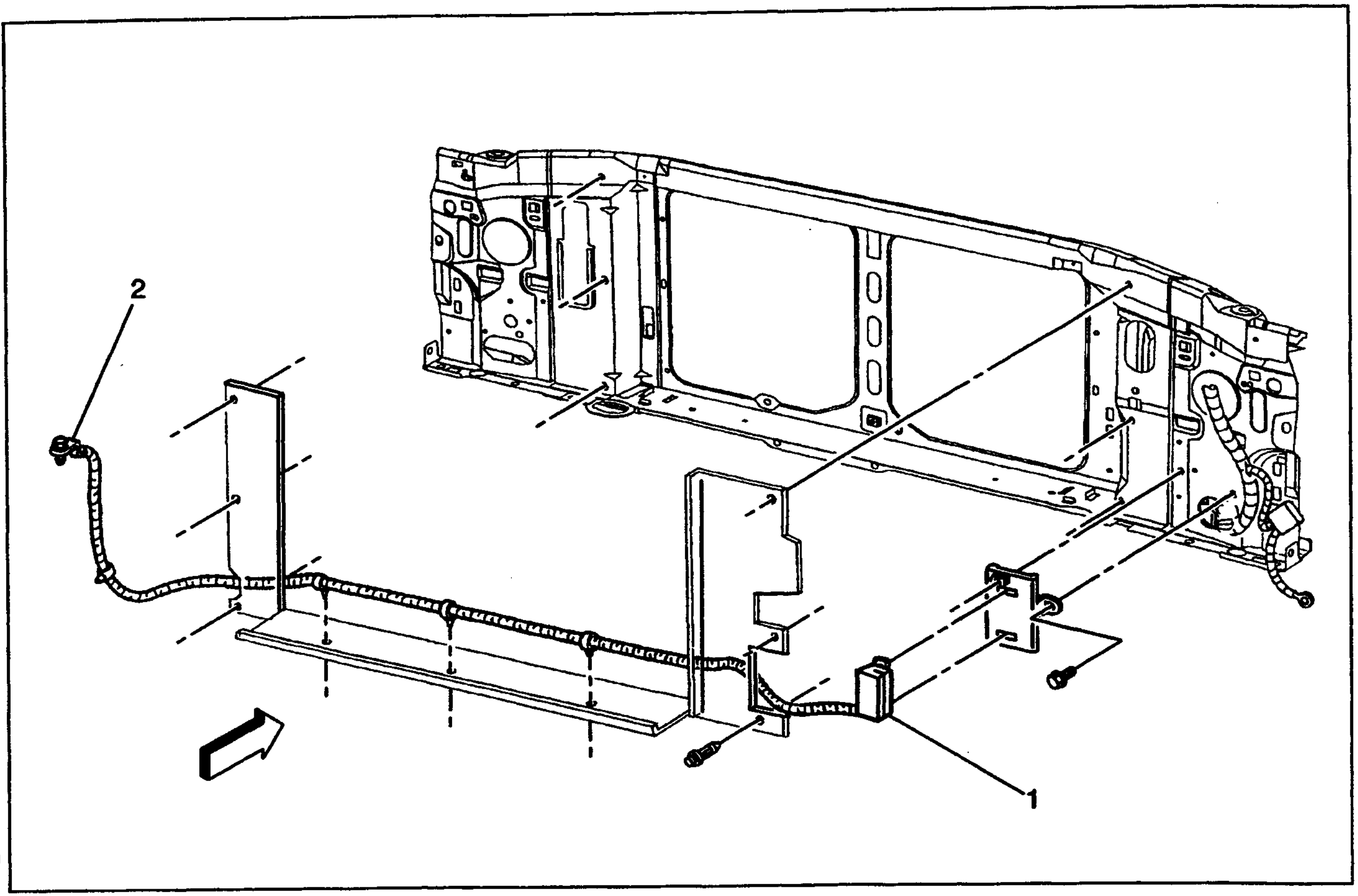


Figure 26

Legend

(1) Mega Fuse

(2) Underhood Bussed Electrical Center (UBEC) Battery Positive Stud

COMPONENT LOCATION VIEWS

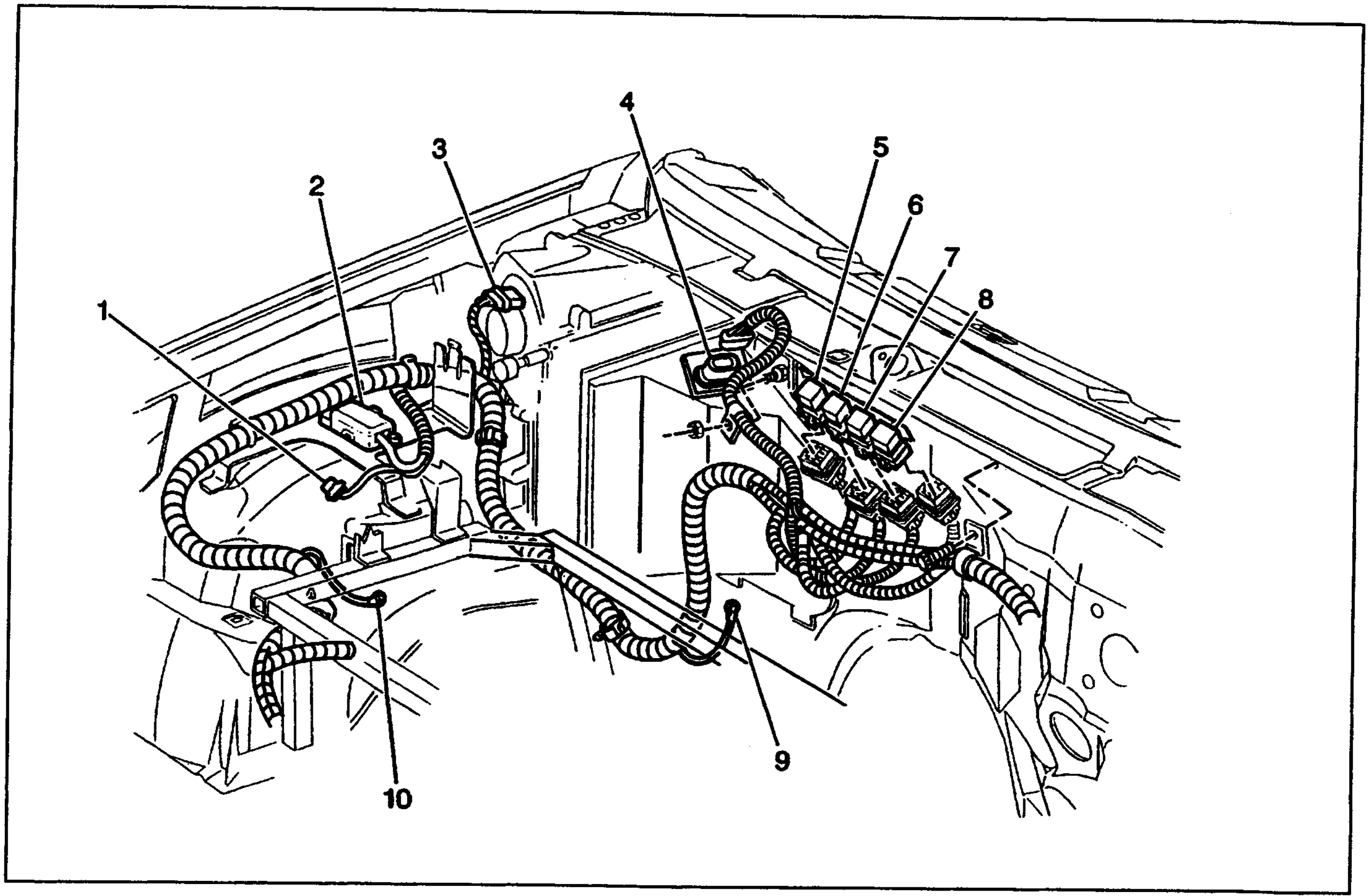


Figure 27

Legend

(1) Auxiliary Heater (FFH) Service Port
(2) Jump Start Block
(3) Blower Motor Connector
(4) Blower Motor Resistor
(5) Battery Valve Primary Relay
(6) Blower Motor Relay
(7) Battery Valve Secondary Relay
(8) Auxiliary Heater Relay
(9) C115
(10) G114

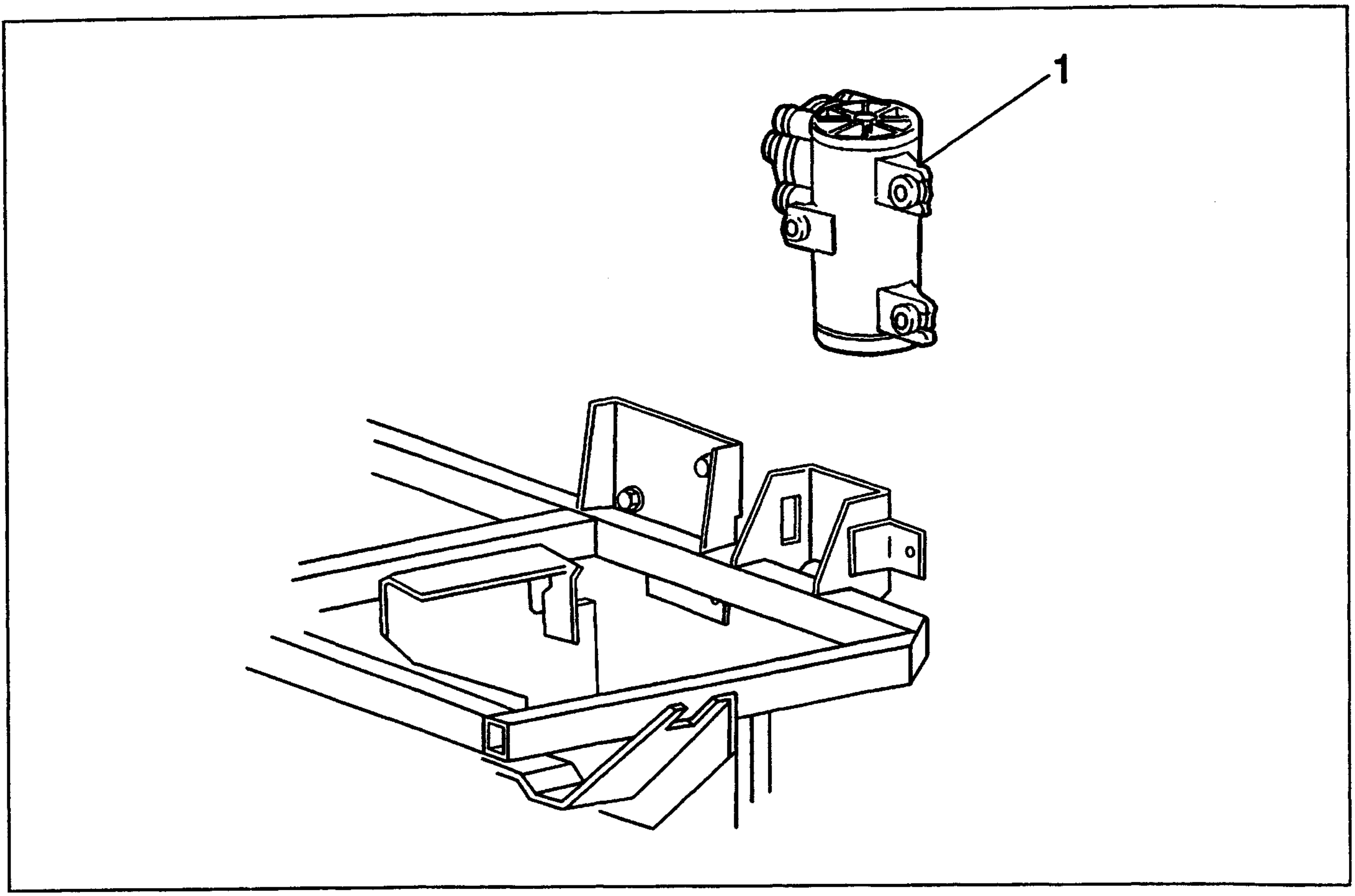


Figure 28

Legend

(1) P/B Booster Vacuum Pump

COMPONENT LOCATION VIEWS

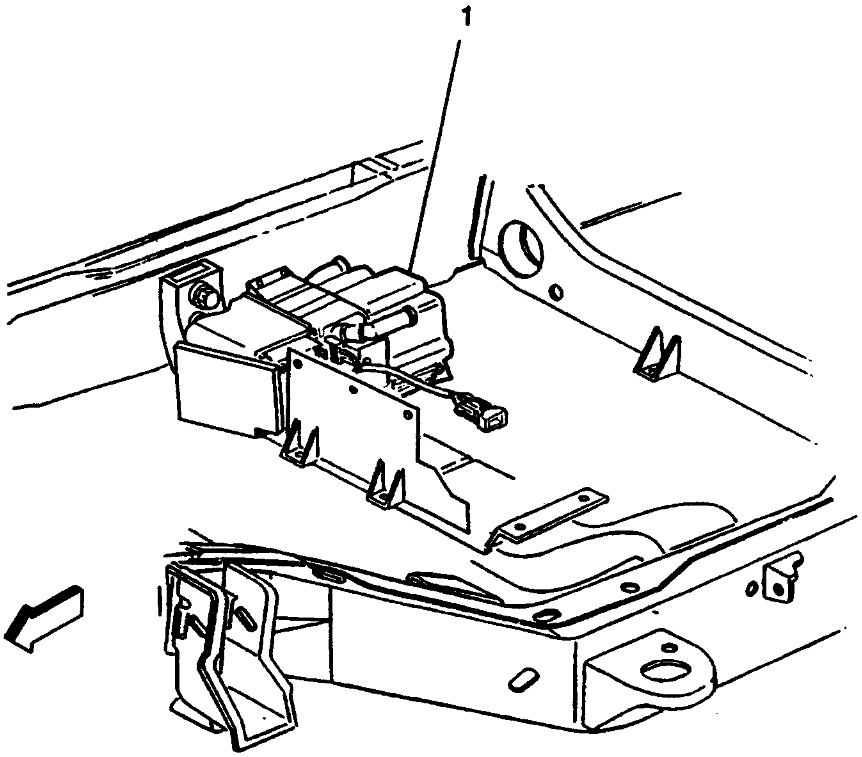


Figure 29

Legend

(1) Auxiliary Heater

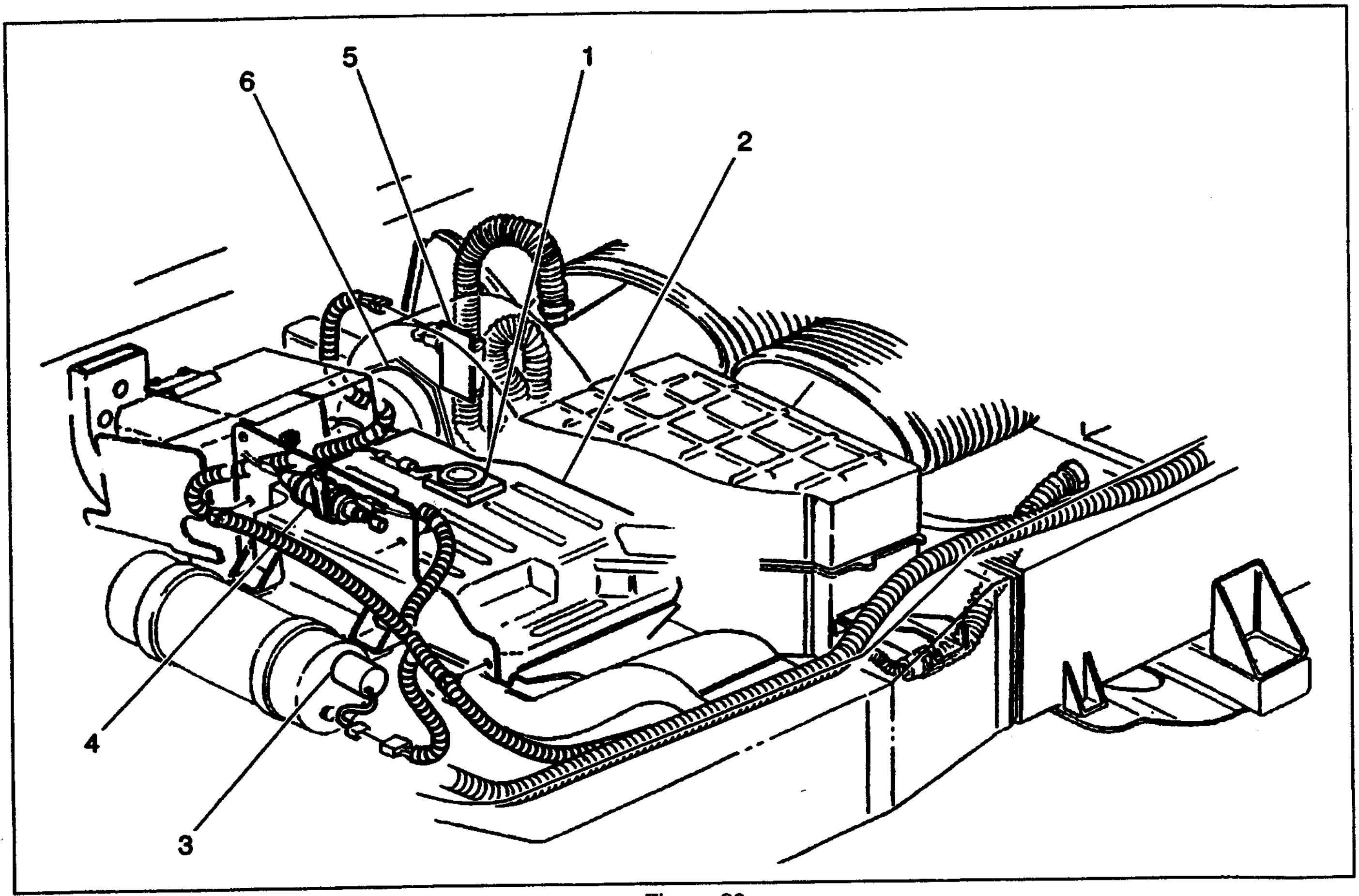


Figure 30

Legend

(1) Fuel Level Sensor
(2) Fuel Tank
(3) P/B Booster Vacuum Switch
(4) Auxiliary Heater Fuel Pump
(5) Drive Motor Battery Pack Air Flow Sensor
(6) Battery Pack Blower Motor

COMPONENT LOCATION VIEWS

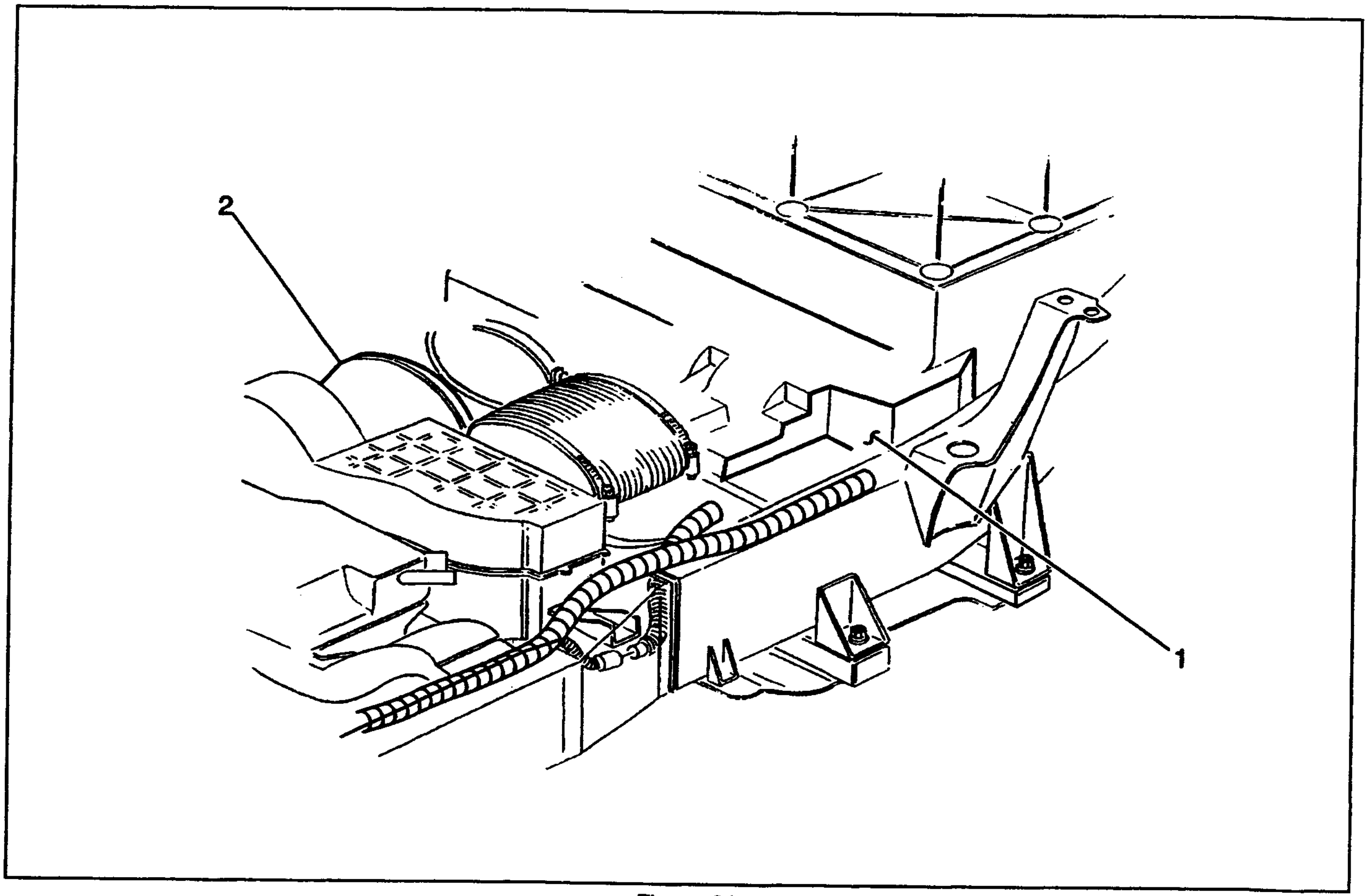


Figure 31

Legend

(1) Battery Pack Assembly

(2) Battery Thermal Module

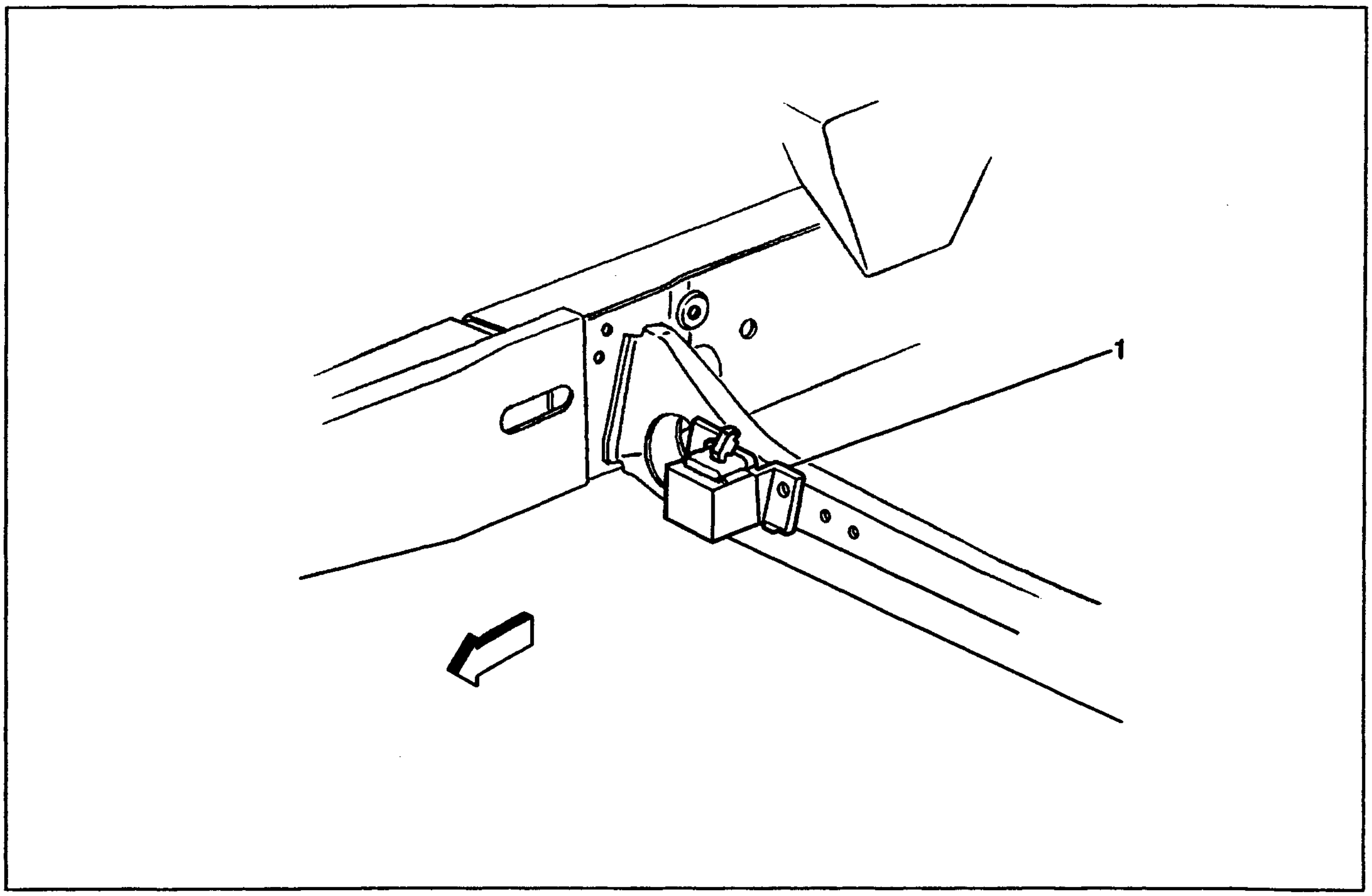


Figure 32

Legend

(1) Supplemental Inflatable Restraint Arming Sensor

COMPONENT LOCATION VIEWS

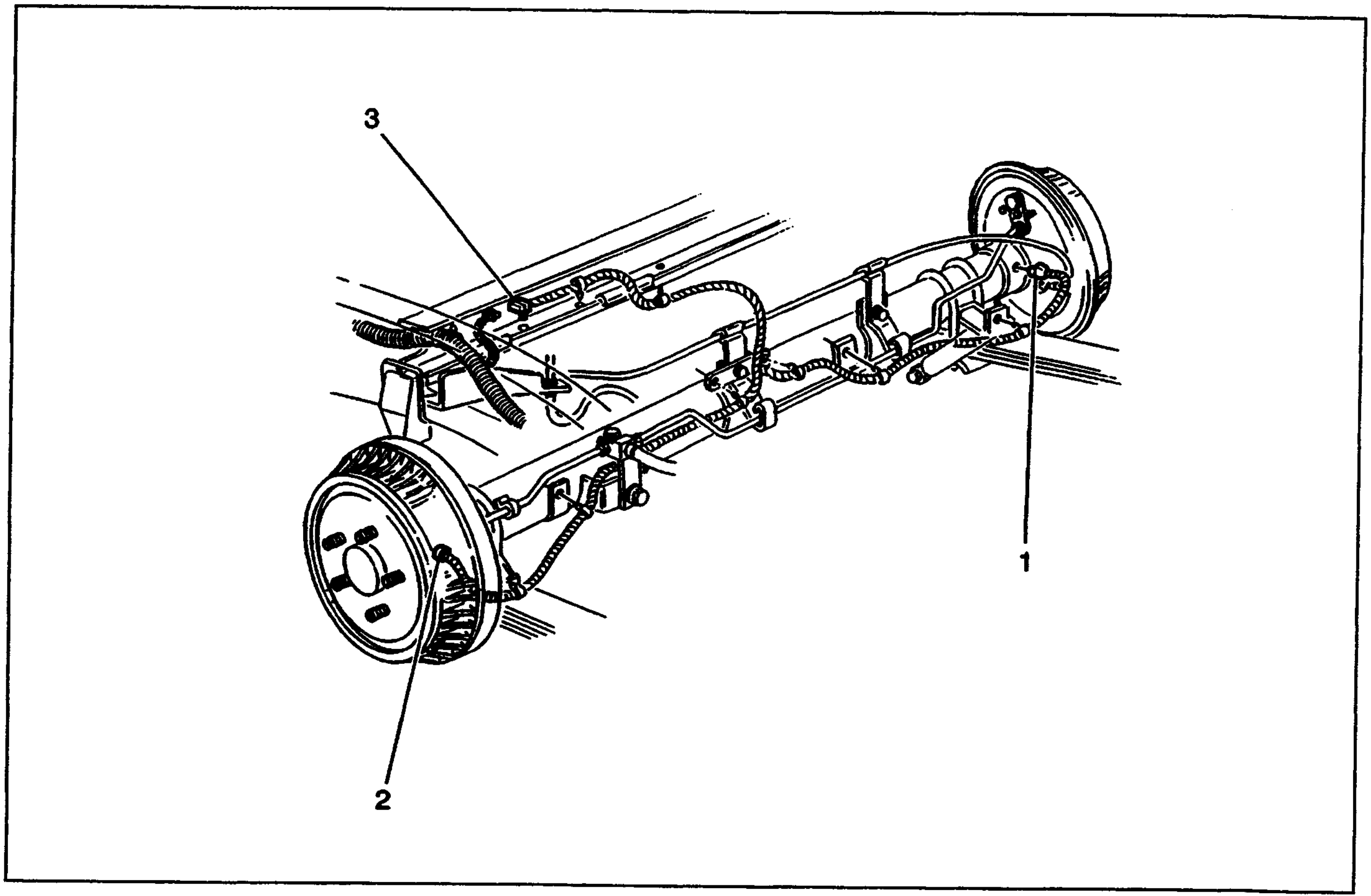


Figure 33

Legend

(1) Wheel Speed Sensor, RH Rear
(2) Wheel Speed Sensor, LH Rear
(3) C301

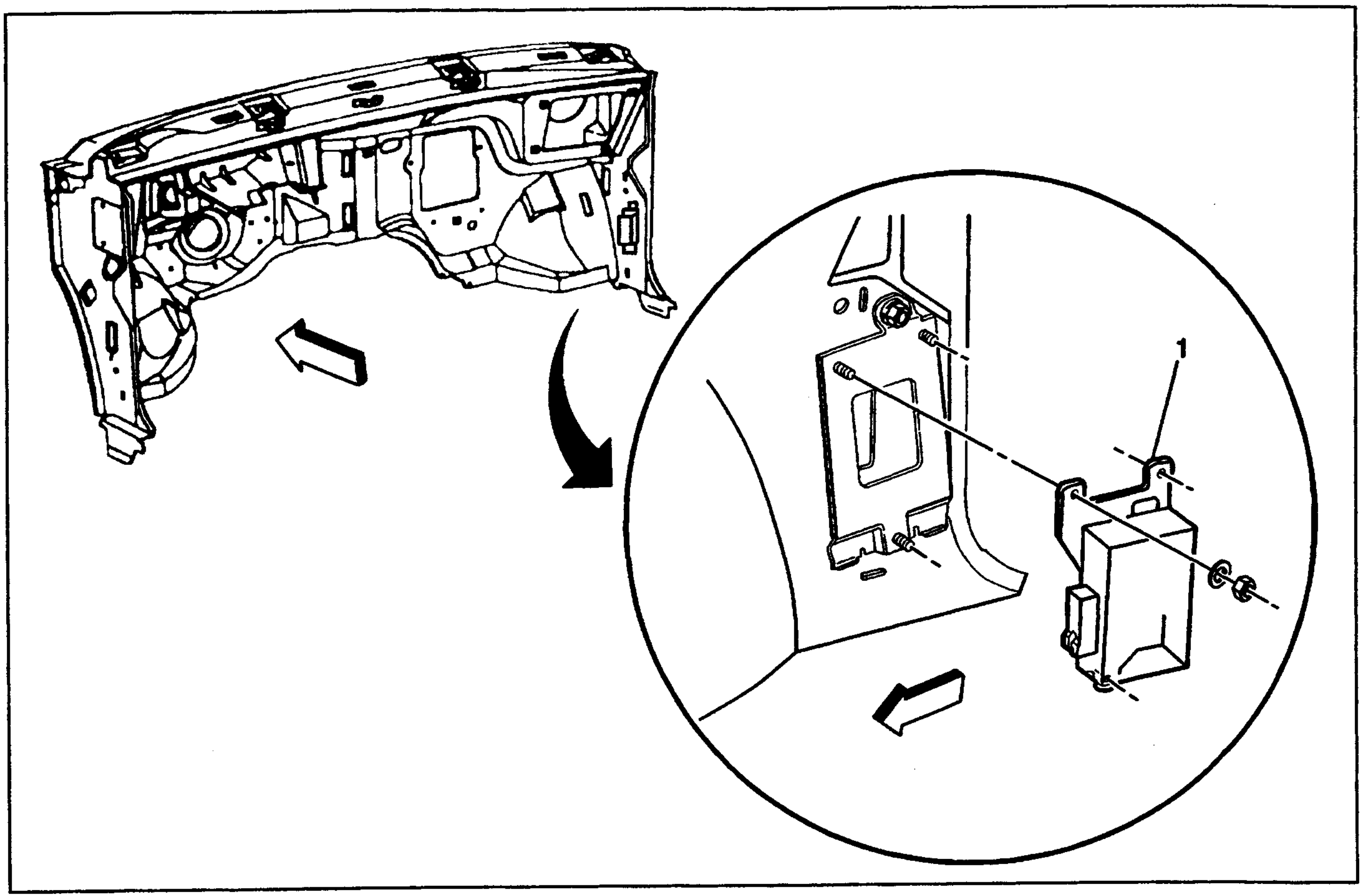


Figure 34

Legend

(1) Body Control Interface Module

COMPONENT LOCATION VIEWS

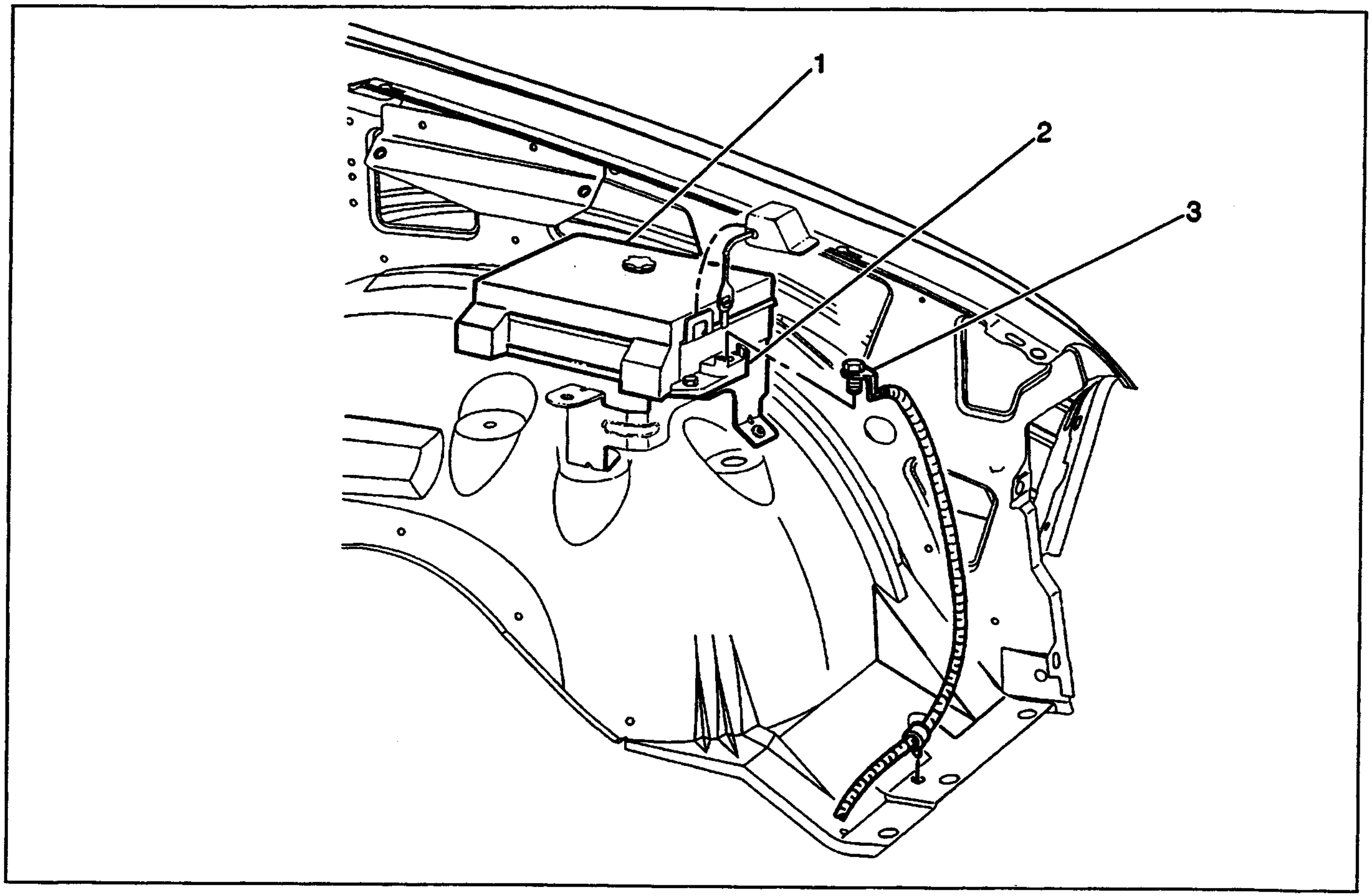


Figure 35

Legend

(1) (UBEC)
(2) Battery Junction Block
(3) (UBEC) Battery Positive Stud

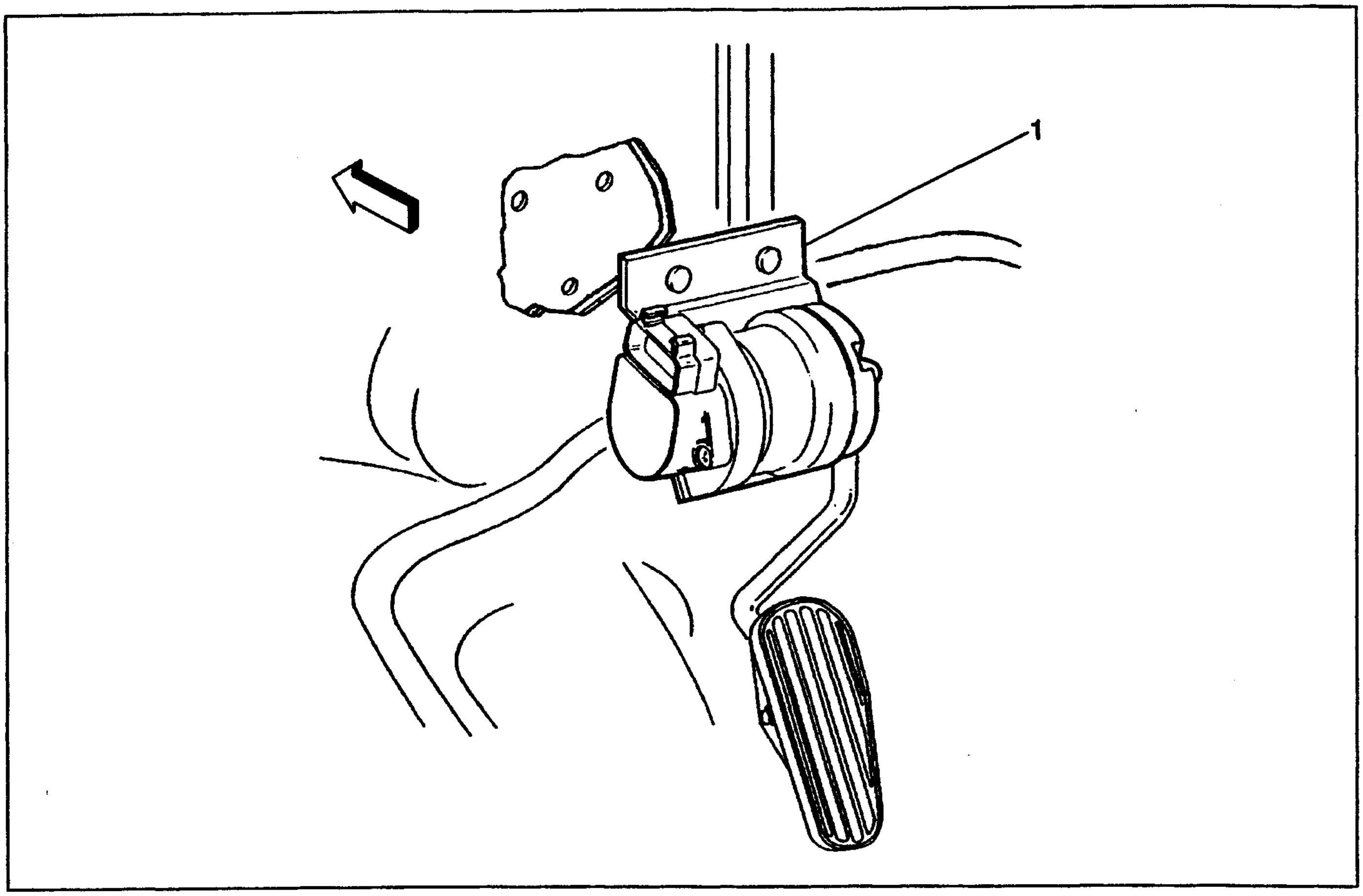


Figure 36

Legend

(1) Accelerator Pedal Position Sensor

COMPONENT LOCATION VIEWS

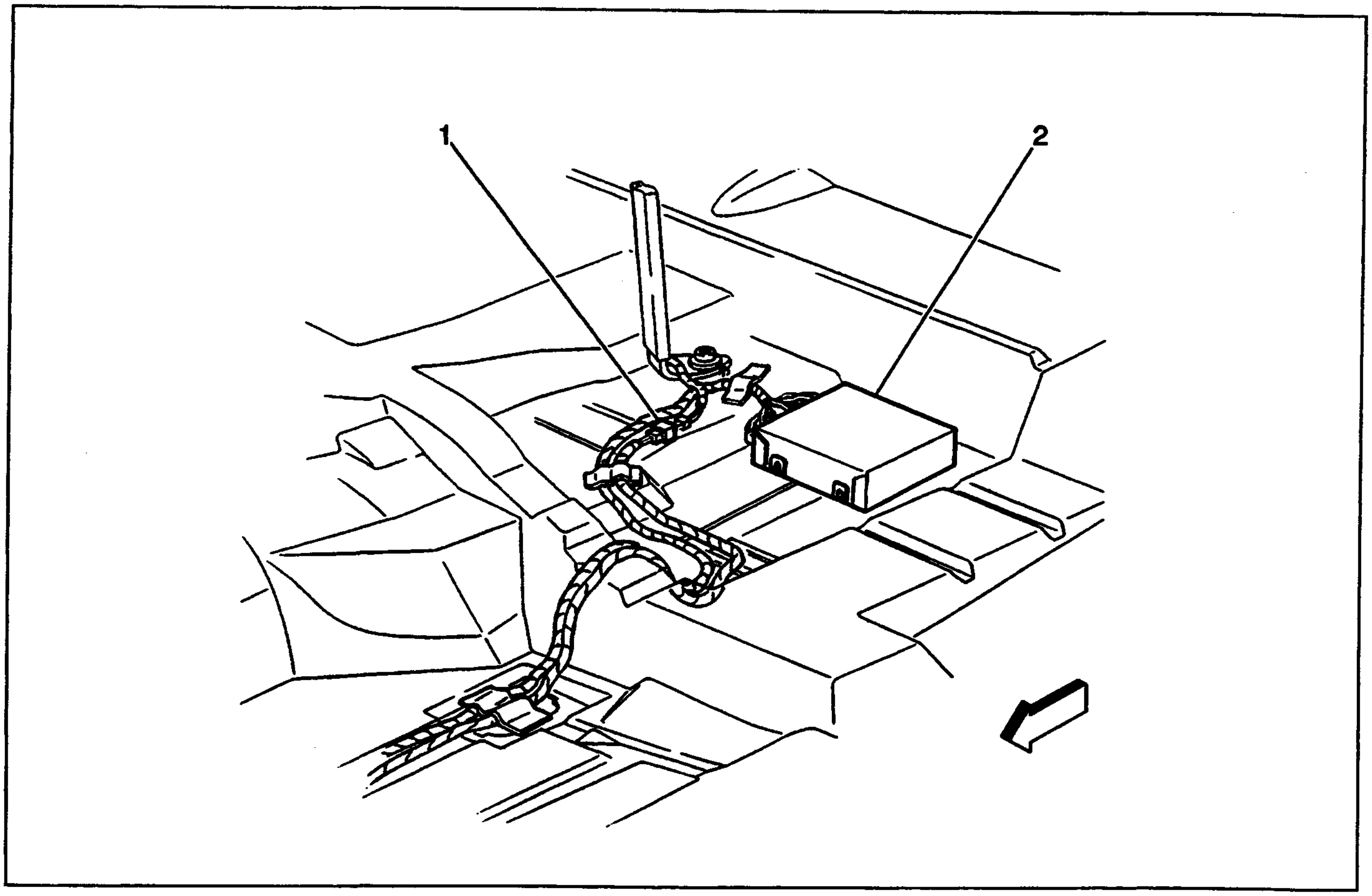


Figure 37

Legend

(1) Safety Belt Switch

(2) Heat Pump Ventilation System (HVPS)/Thermal Control Module (HTCM)

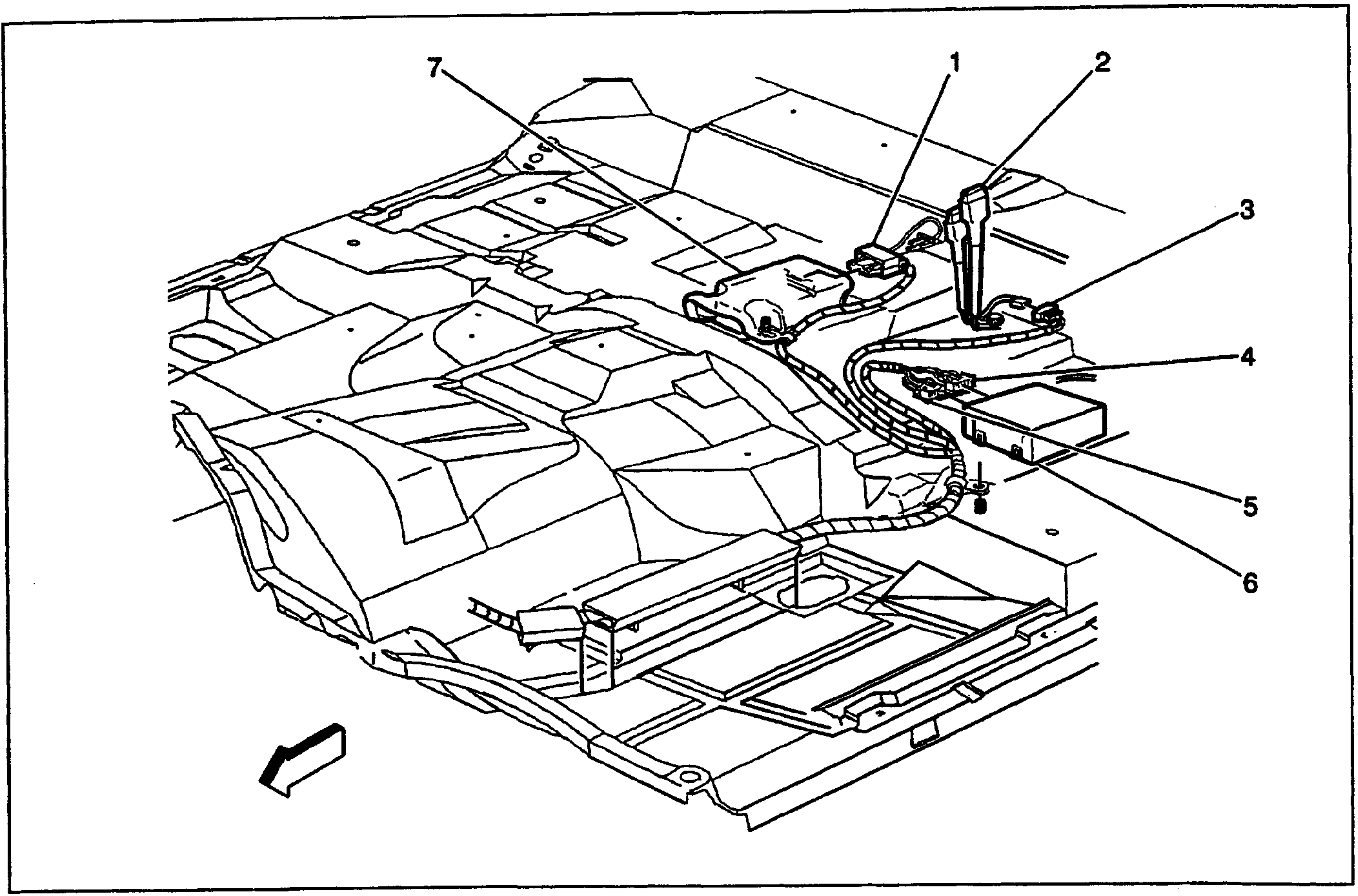


Figure 38

Legend

1. (1) Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)
2. (2) Safety Belt
3. (3) Safety Belt Switch
4. (4) Heat Pump Ventilation System (HVPS)/Thermal Control Module - C1
5. (5) Heat Pump Ventilation System (HVPS)/Thermal Control Module - C2
6. (6) Heat Pump Ventilation System (HVPS)/Thermal Control Module (HTCM)

COMPONENT LOCATION VIEWS

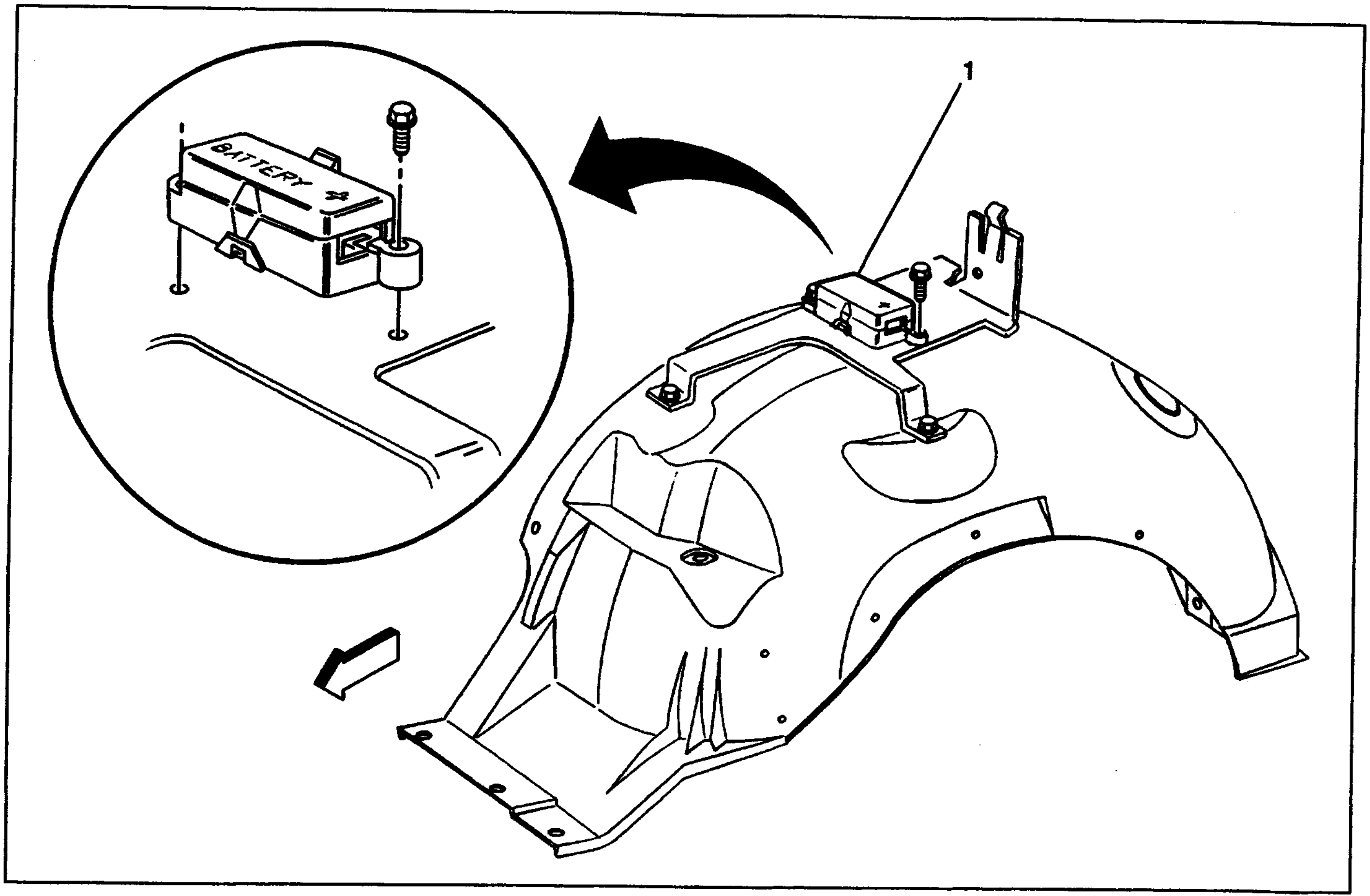


Figure 39

Legend

(1) Jump Start Block

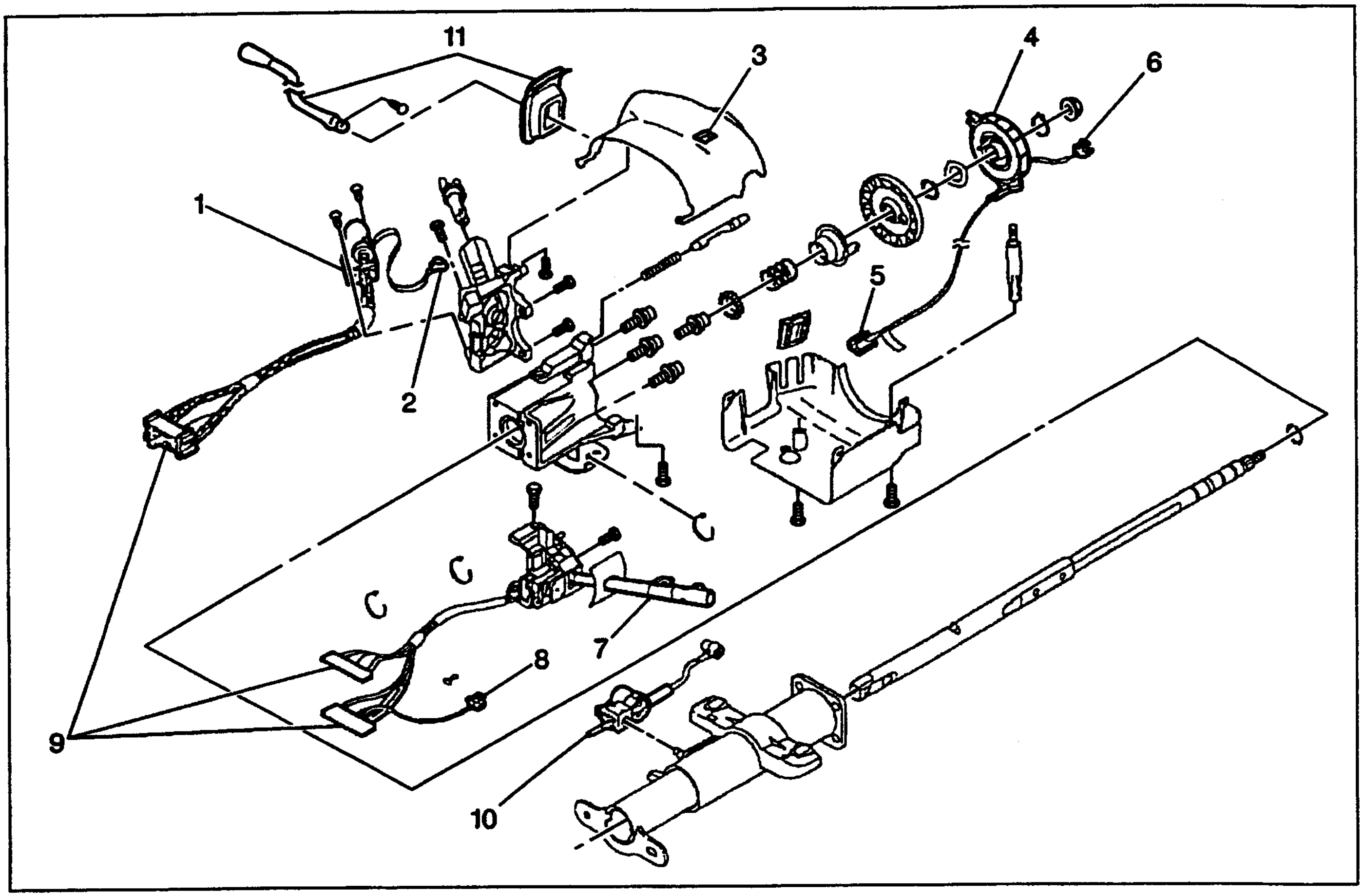


Figure 40

Legend

(1) Ignition Switch and Ignition Key in Alarm Switch
(2) Hazard Switch Connector
(3) Hazard Switch Location
(4) Supplemental Inflatable Restraint Steering Wheel Module Coil
(5) C215
(6) Supplemental Inflatable Restraint Wheel Inflator Module Connector
(7) Multifunction Switch
(8) Park Position Switch Connector
(9) C211 A/B/C
(10) Brake/Transmission Shift Interlock (BTSI) Actuator
(11) Transmission Shift Lever

COMPONENT LOCATION VIEWS

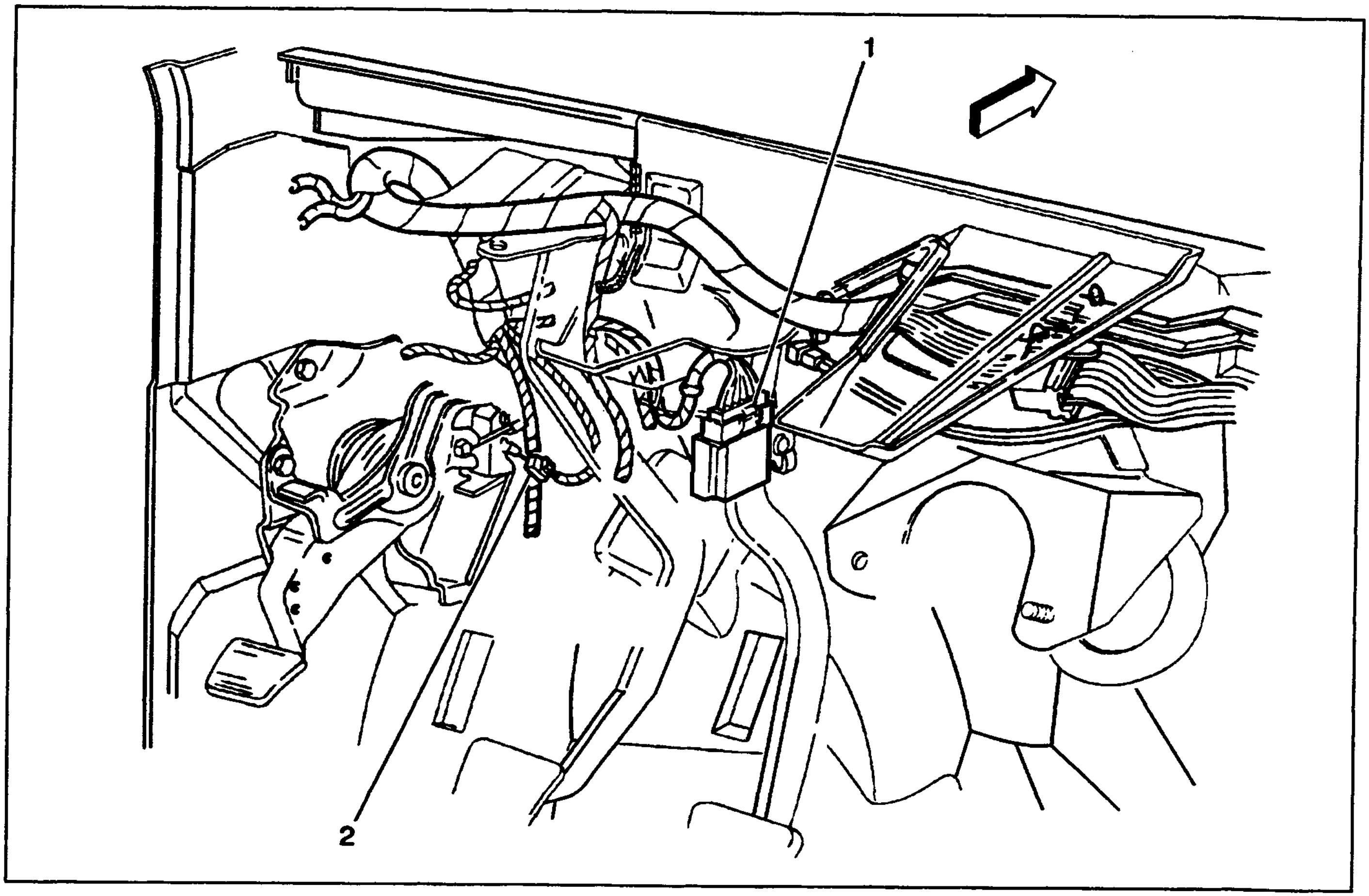


Figure 41

Legend

(1) Stoplamps Switch

(2) Parking Brake Switch

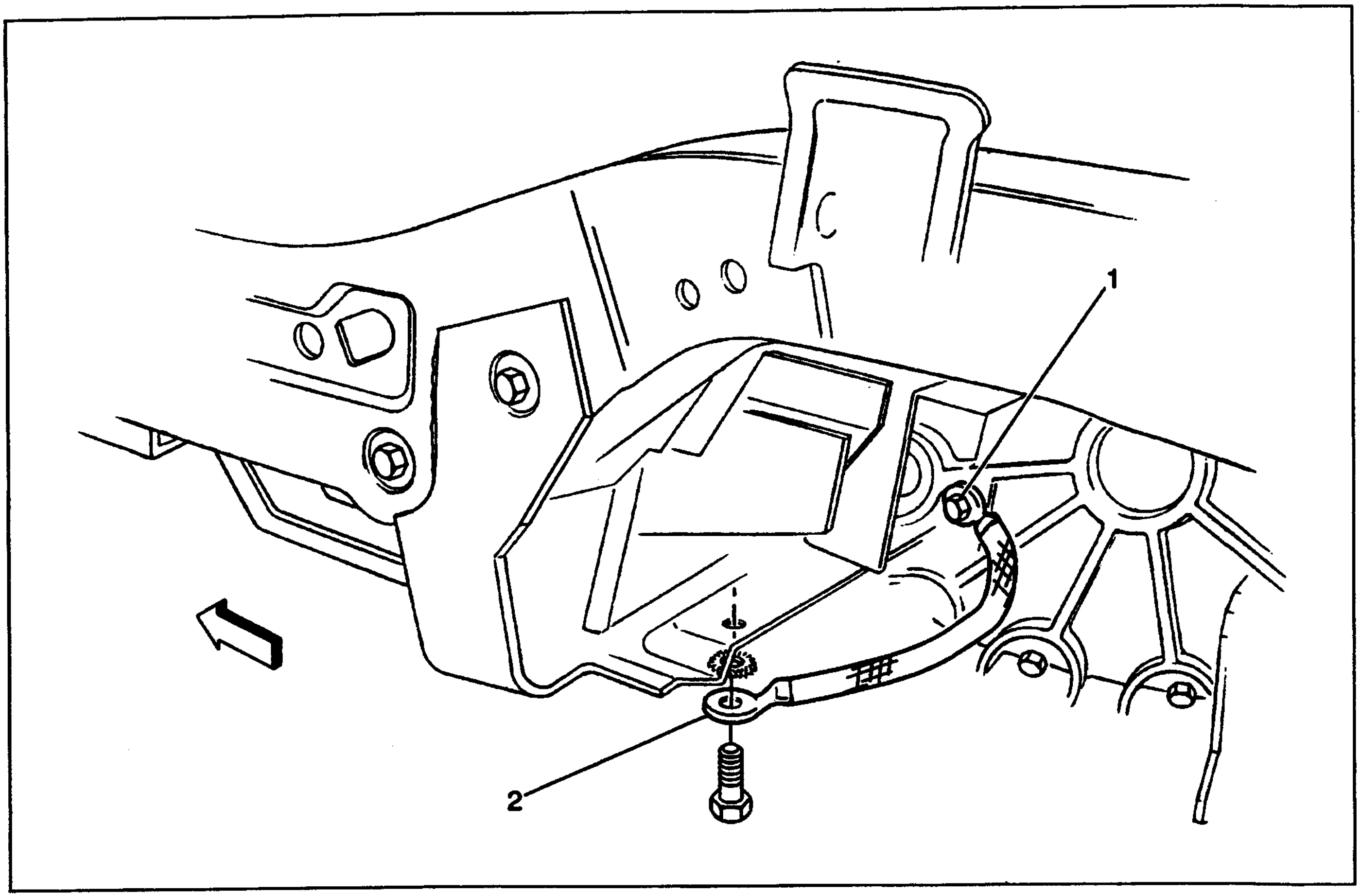


Figure 42

Legend

(1) Drive Motor

(2) Ground Strap

COMPONENT LOCATION VIEWS

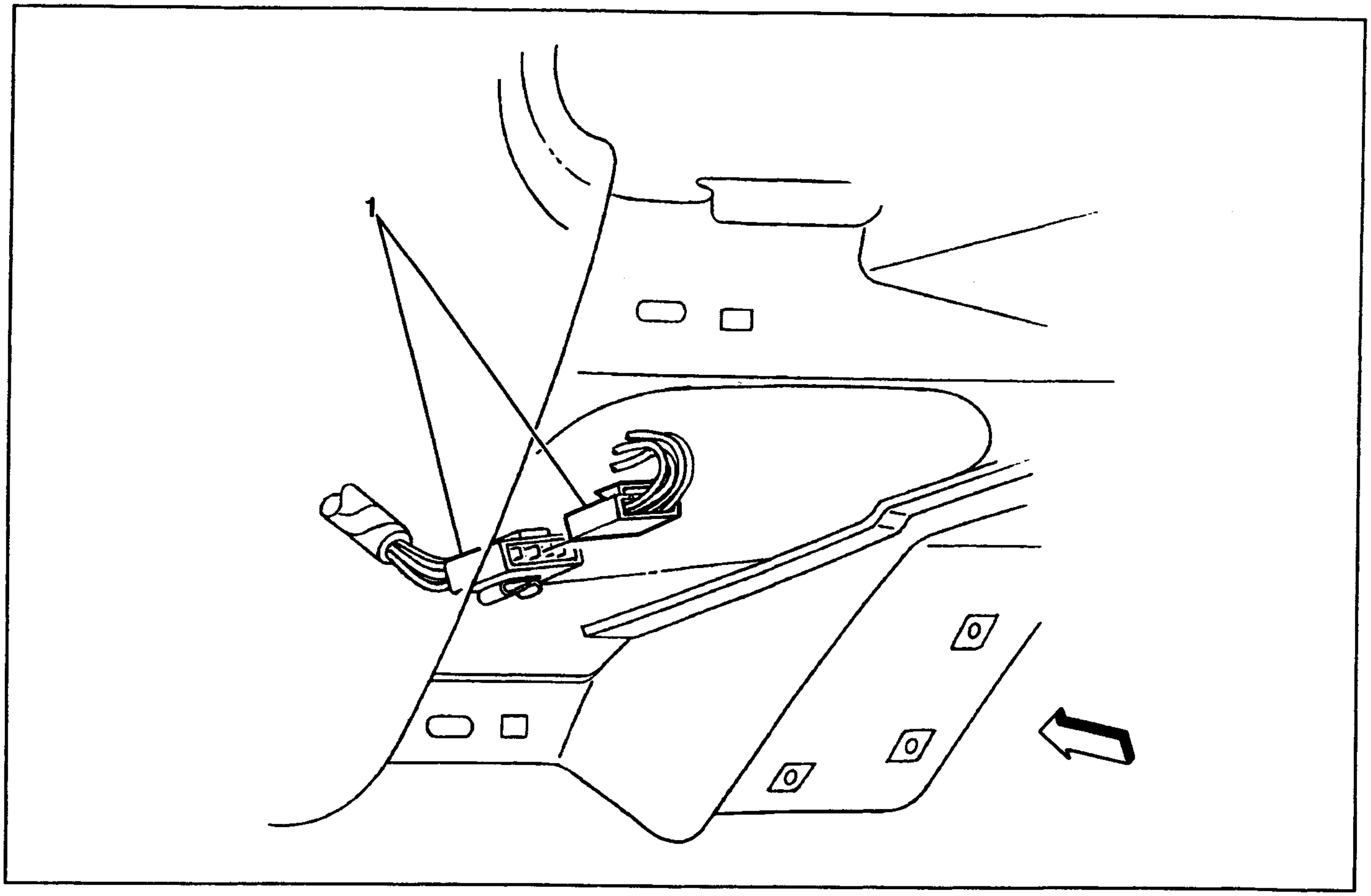


Figure 43

Legend

(1) C204

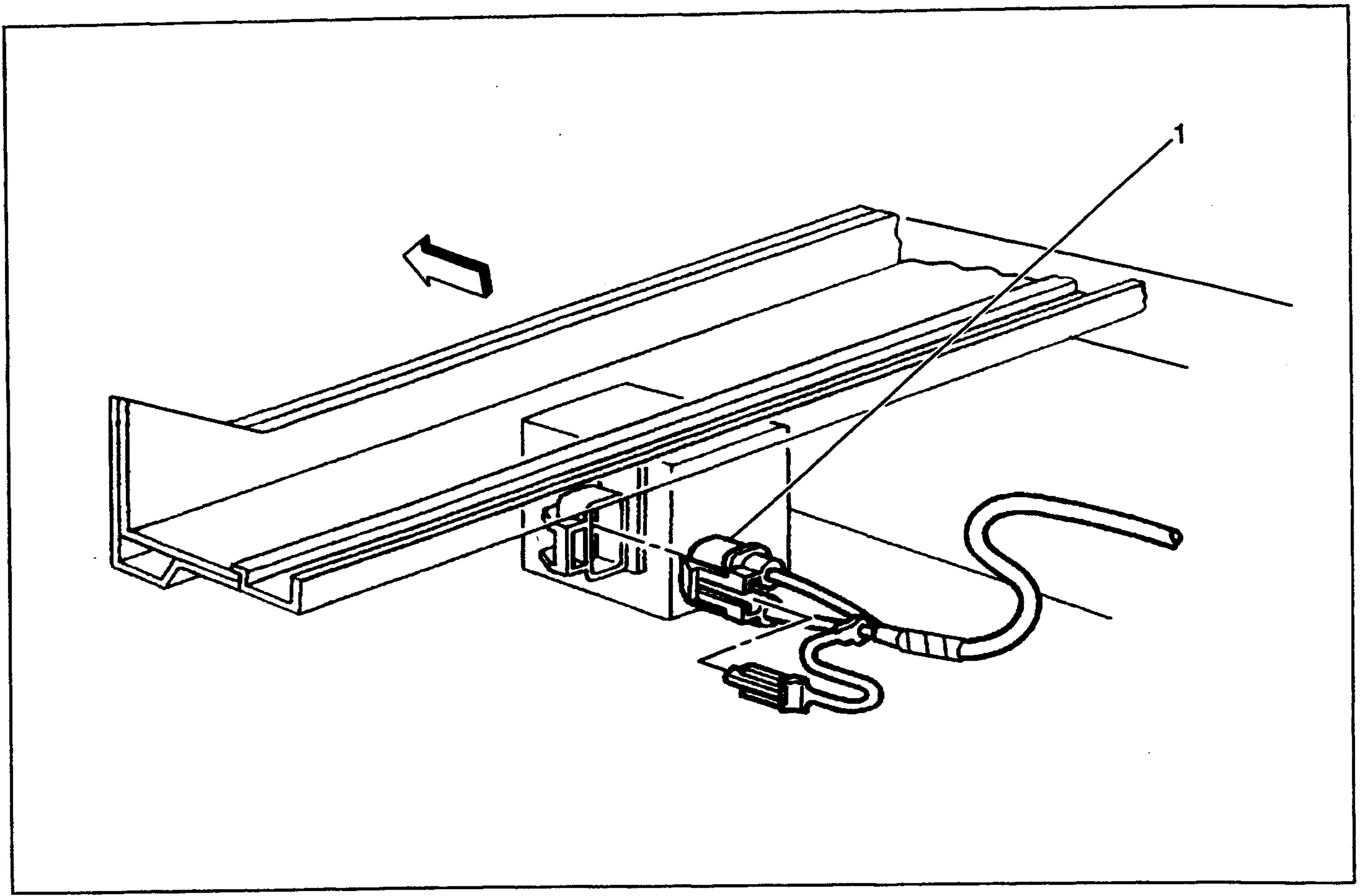


Figure 44

Legend

(1) Supplemental Inflatable Restraint Discriminating Sensor (Typical)

COMPONENT LOCATION VIEWS

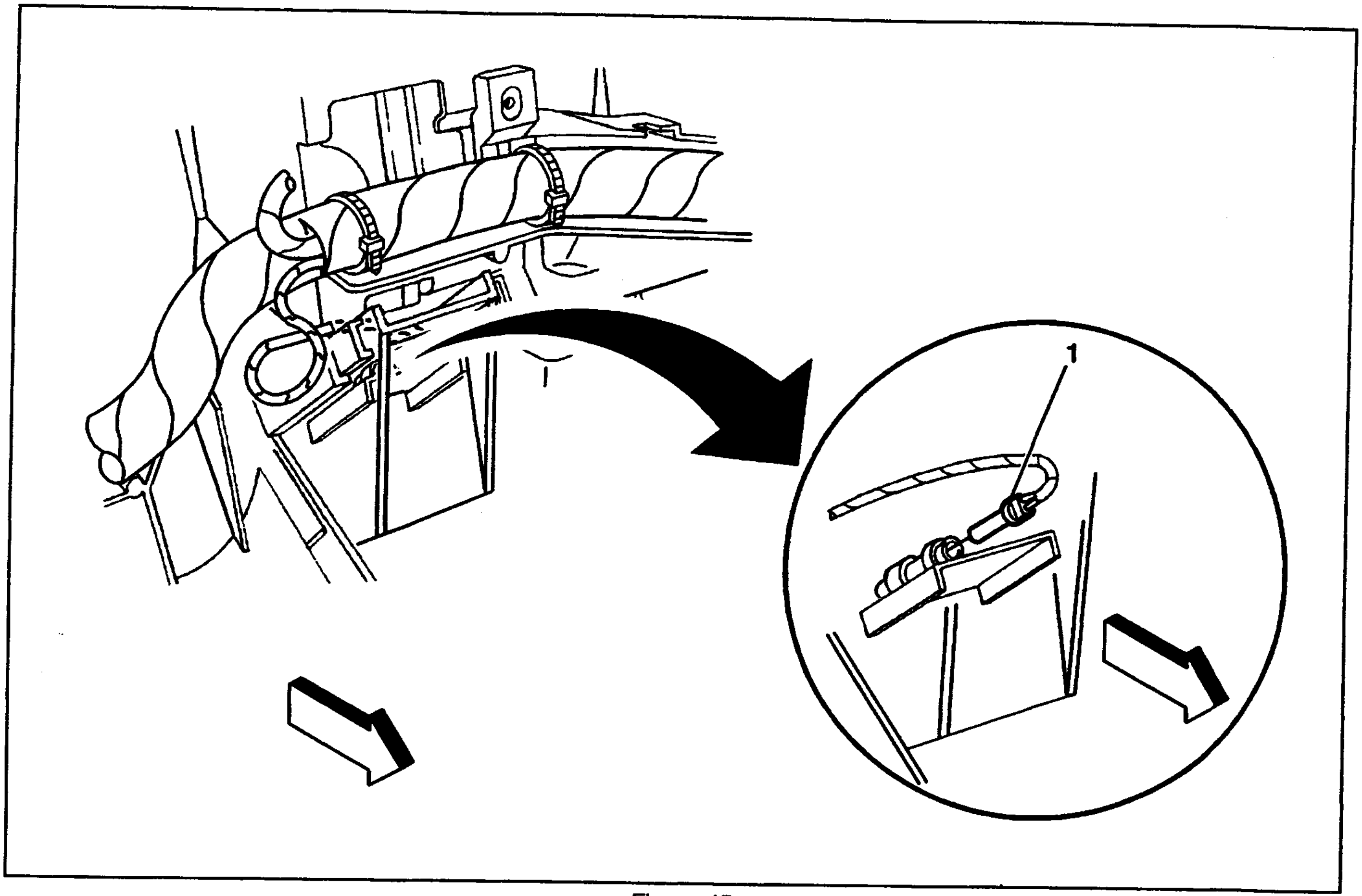


Figure 45

Legend

(1) Ashtray Lamp

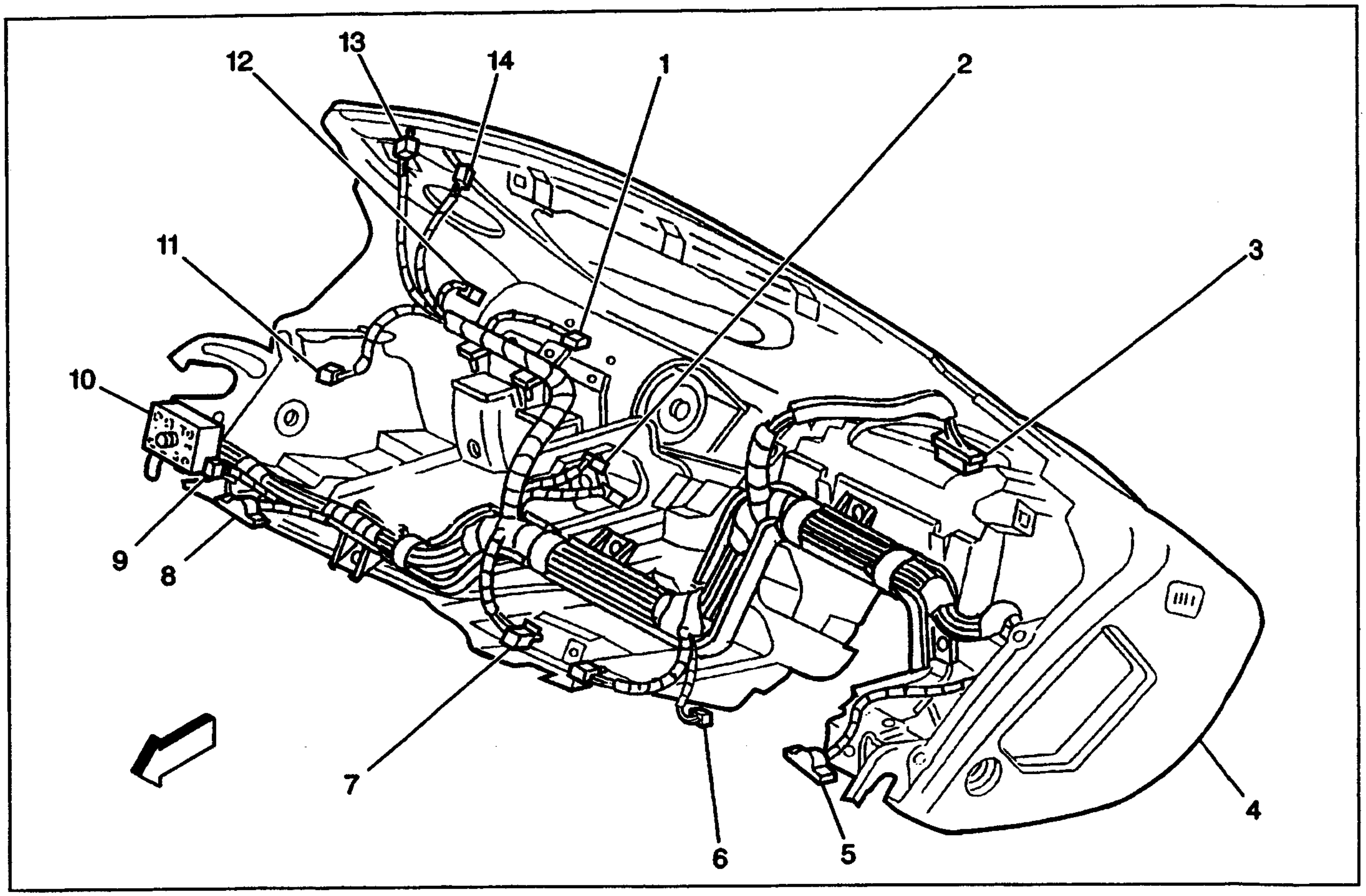


Figure 46

Legend

- (1) Inflatable Restraint IP Module Switch Connector
- (2) AM/FM Stereo Radio Connector
- (3) Instrument Cluster Connector
- (4) Instrument Panel (IP)
- (5) Courtesy Lamp, LF Console
- (6) Truck Body Control (TBC) Module - C3
- (7) SP203
- (8) Courtesy Lamp, RF Console
- (9) C102
- (10) C203
- (11) Door Jamb Switch, RF
- (12) IP Compartment Lamp Connector
- (13) Ambient Light Sensor
- (14) Speaker, RH IP

COMPONENT LOCATION VIEWS

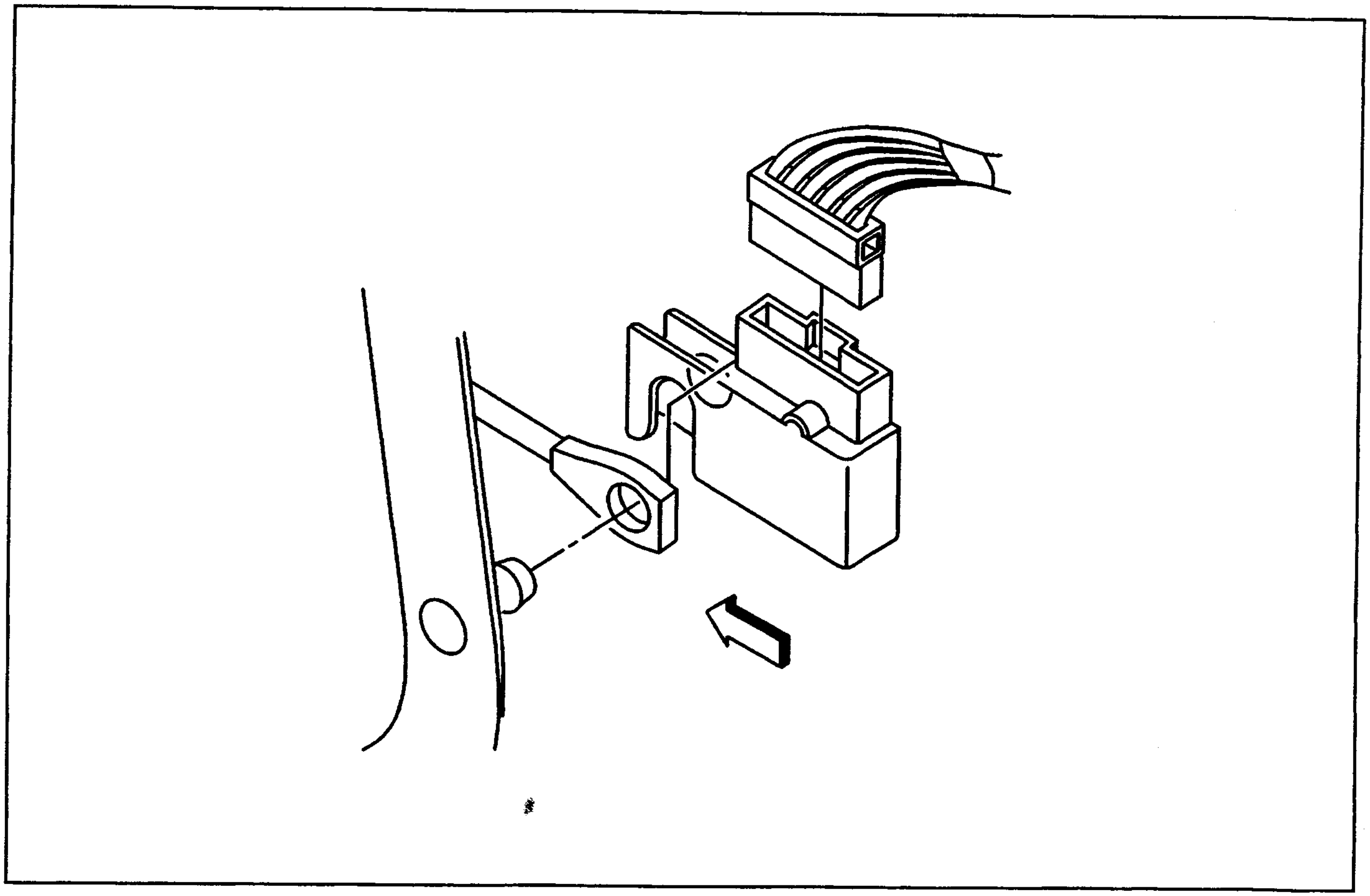


Figure 47

Legend

(1) Stoplamps Switch

(2) IP Harness

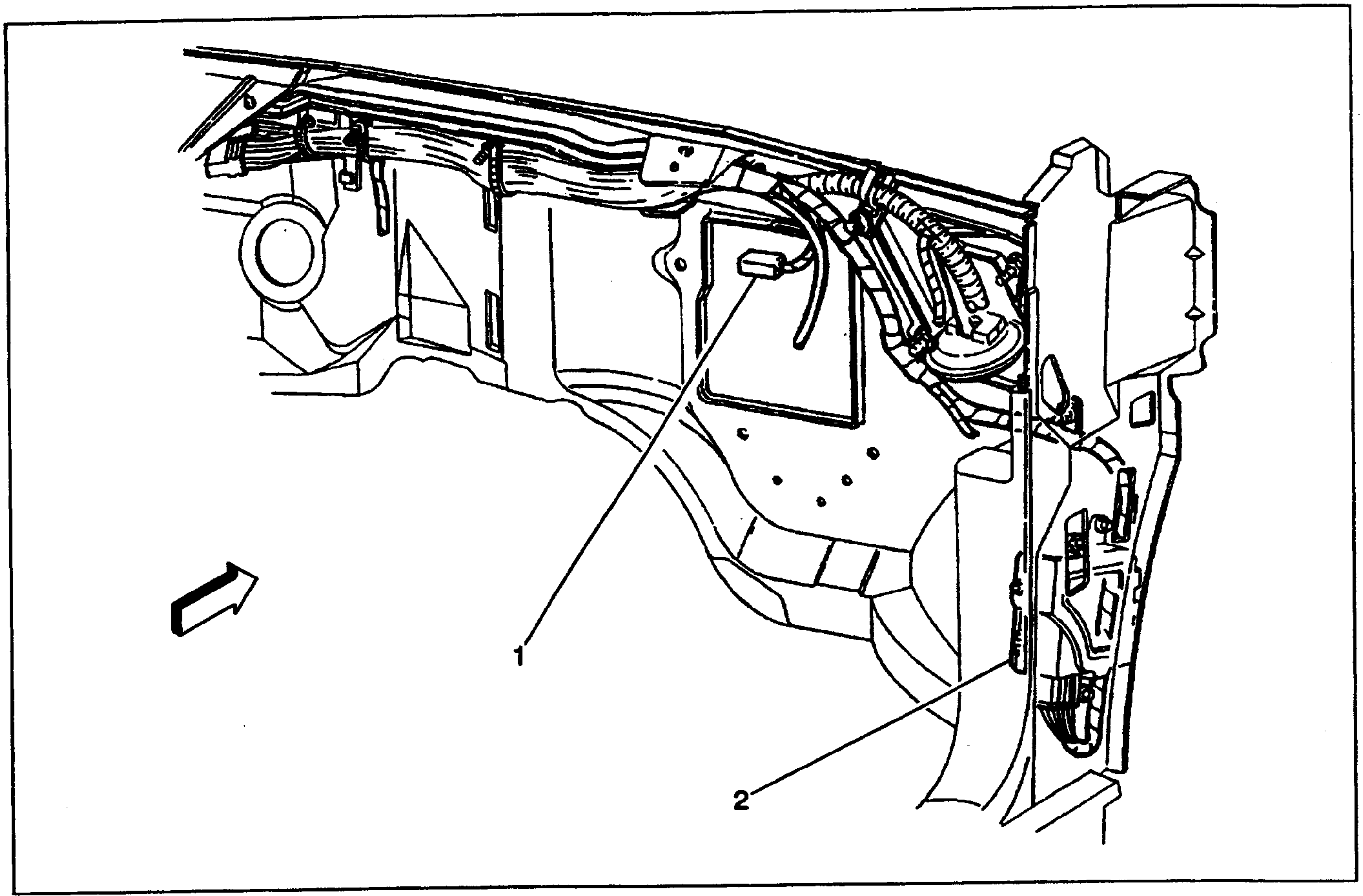


Figure 48

Legend

(1) Outside Air Valve Actuator Motor

(2) Body Control Interface Module

COMPONENT LOCATION VIEWS

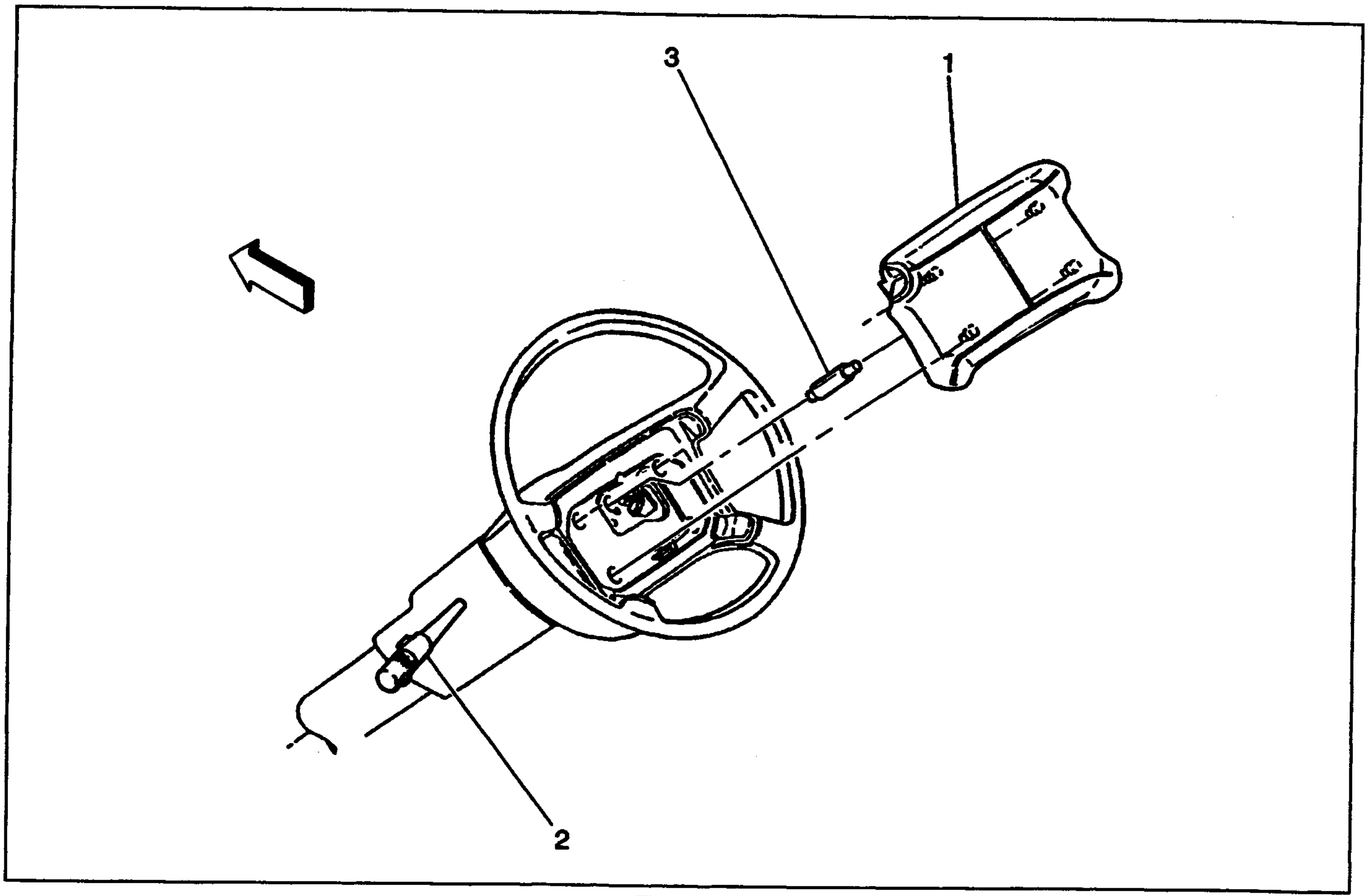


Figure 49

Legend

(1) Supplemental Inflatable Restraint Steering Wheel Inflator Module
(2) Multifunction Switch
(3) Horn Switch (Contact Plunger)

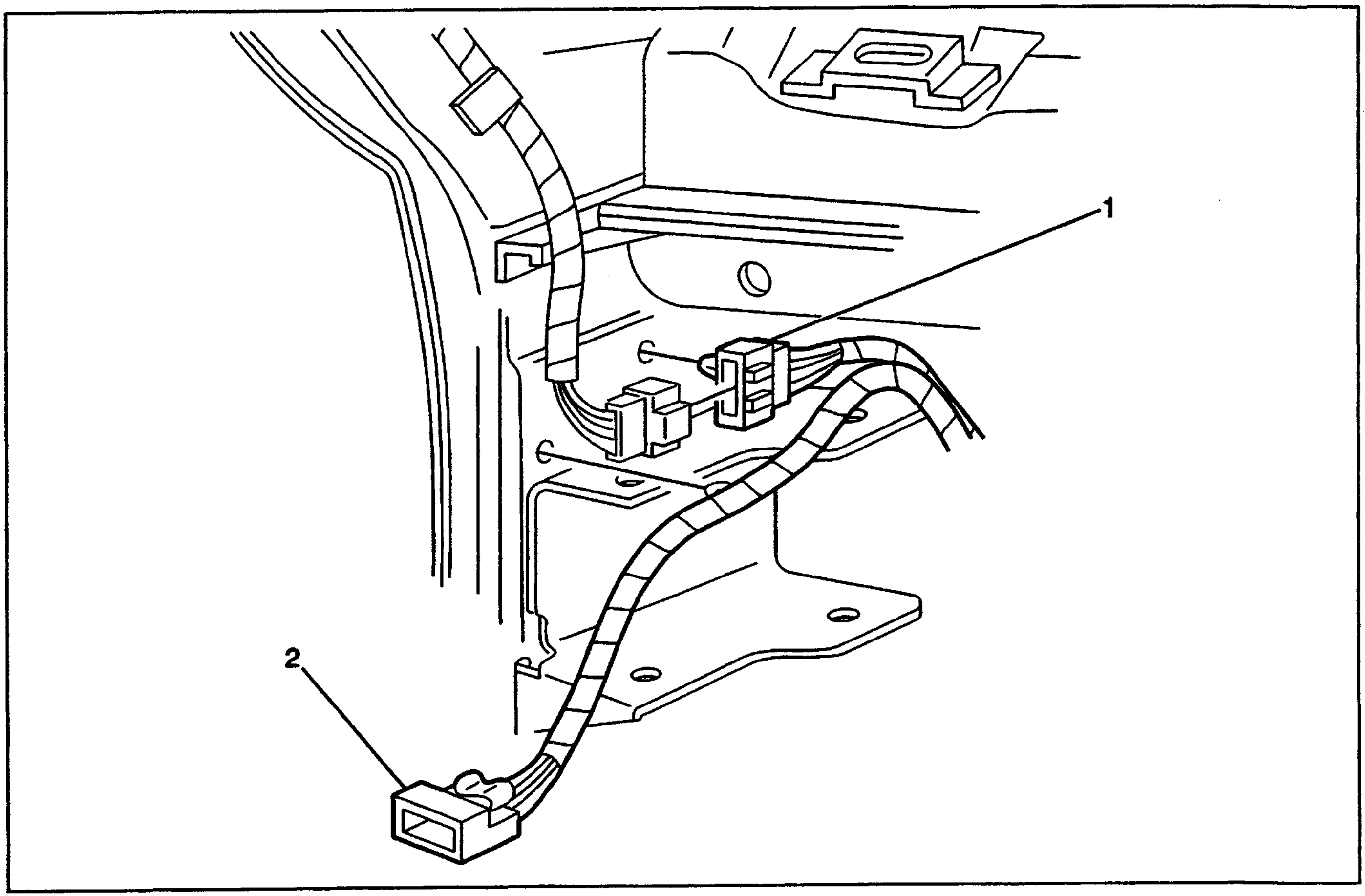


Figure 50

Legend

(1) C205

(2) C207

COMPONENT LOCATION VIEWS

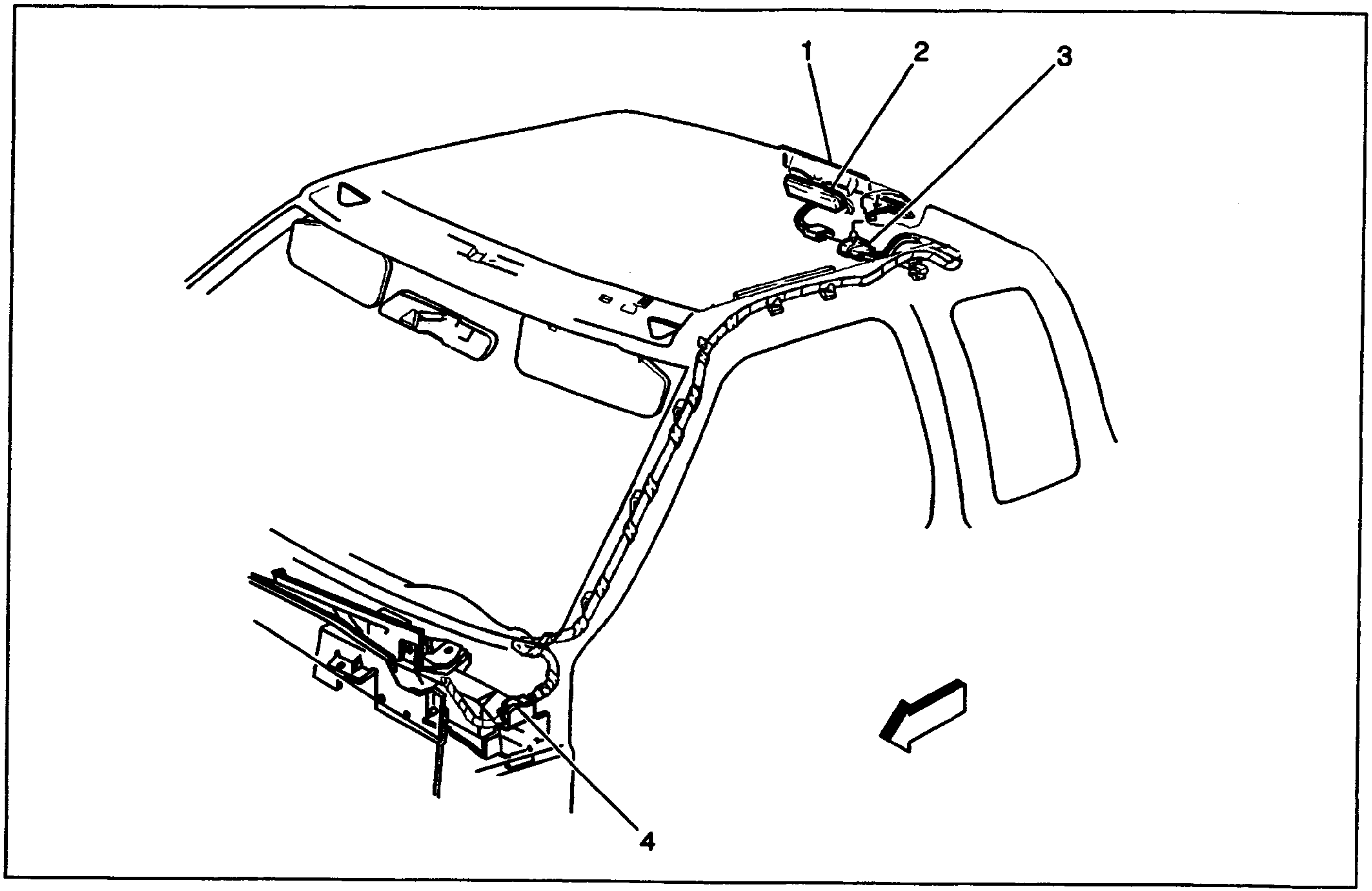


Figure 51

Legend

(1) High-Mounted Stop Lamp
(2) Dome Lamp
(3) Dome Lamp and High-Mounted Stop Lamp Connector
(4) C205

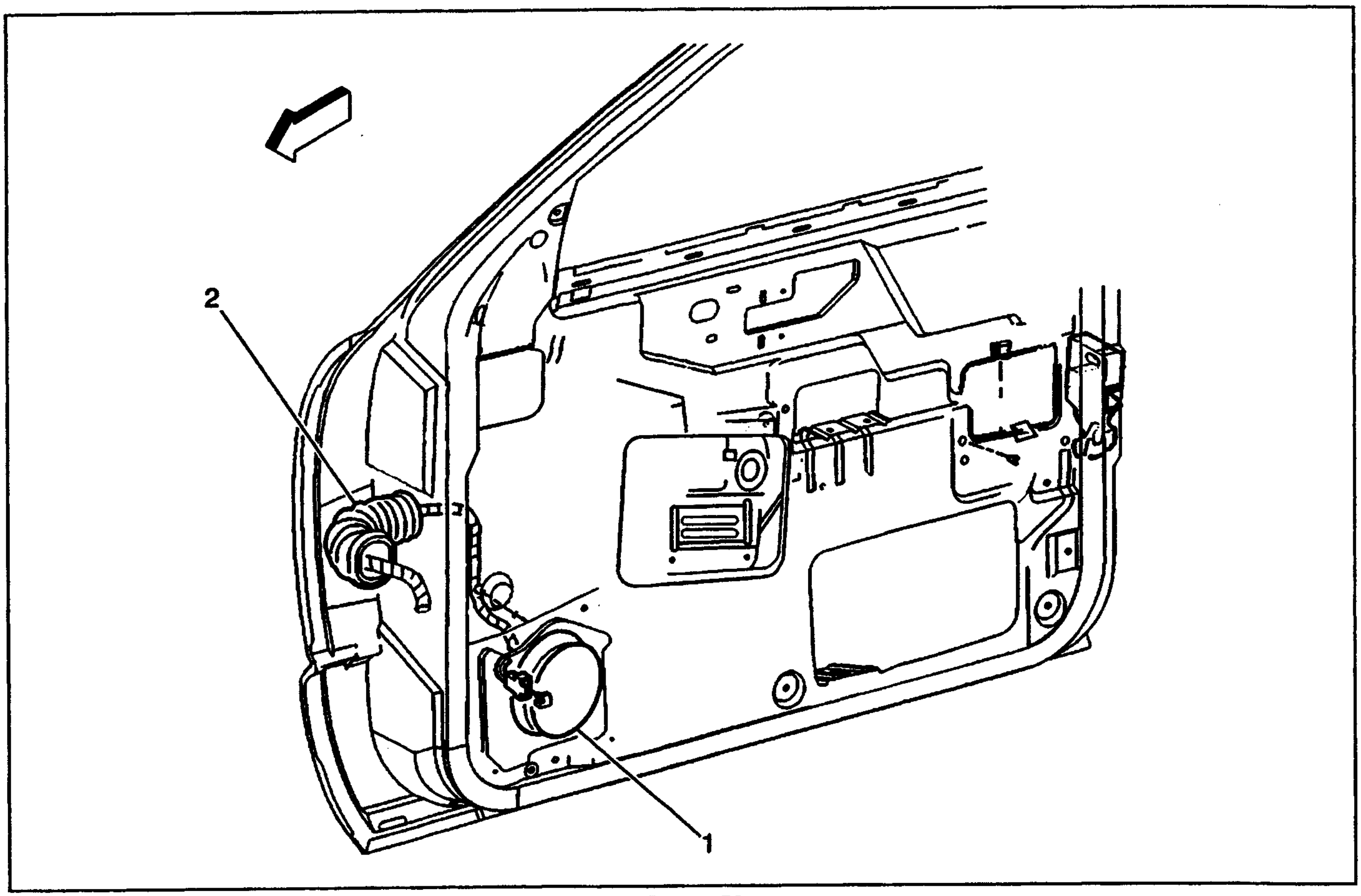


Figure 52

Legend

(1) Front Door Speaker, RH (LH Similar)

(2) P500 (LH) /P600 (RH)

COMPONENT LOCATION VIEWS

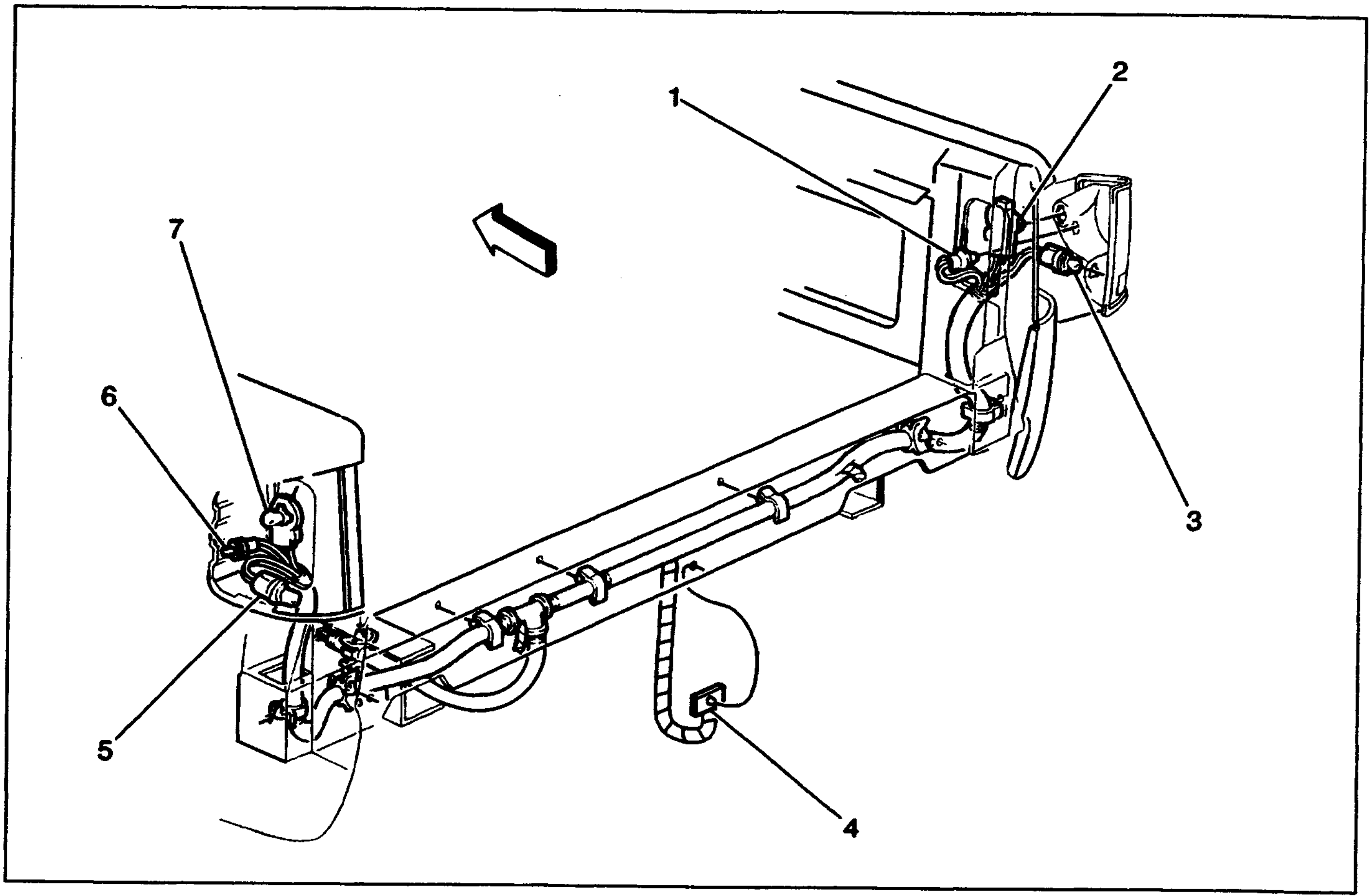


Figure 53

Legend

(1) Marker Lamp, RR
(2) Park and Turn Signal Lamp, RR
(3) Backup Lamp, RH
(4) SP400
(5) Backup Lamp, LH
(6) Marker Lamp, LR
(7) Park and Turn Signal Lamp, LR

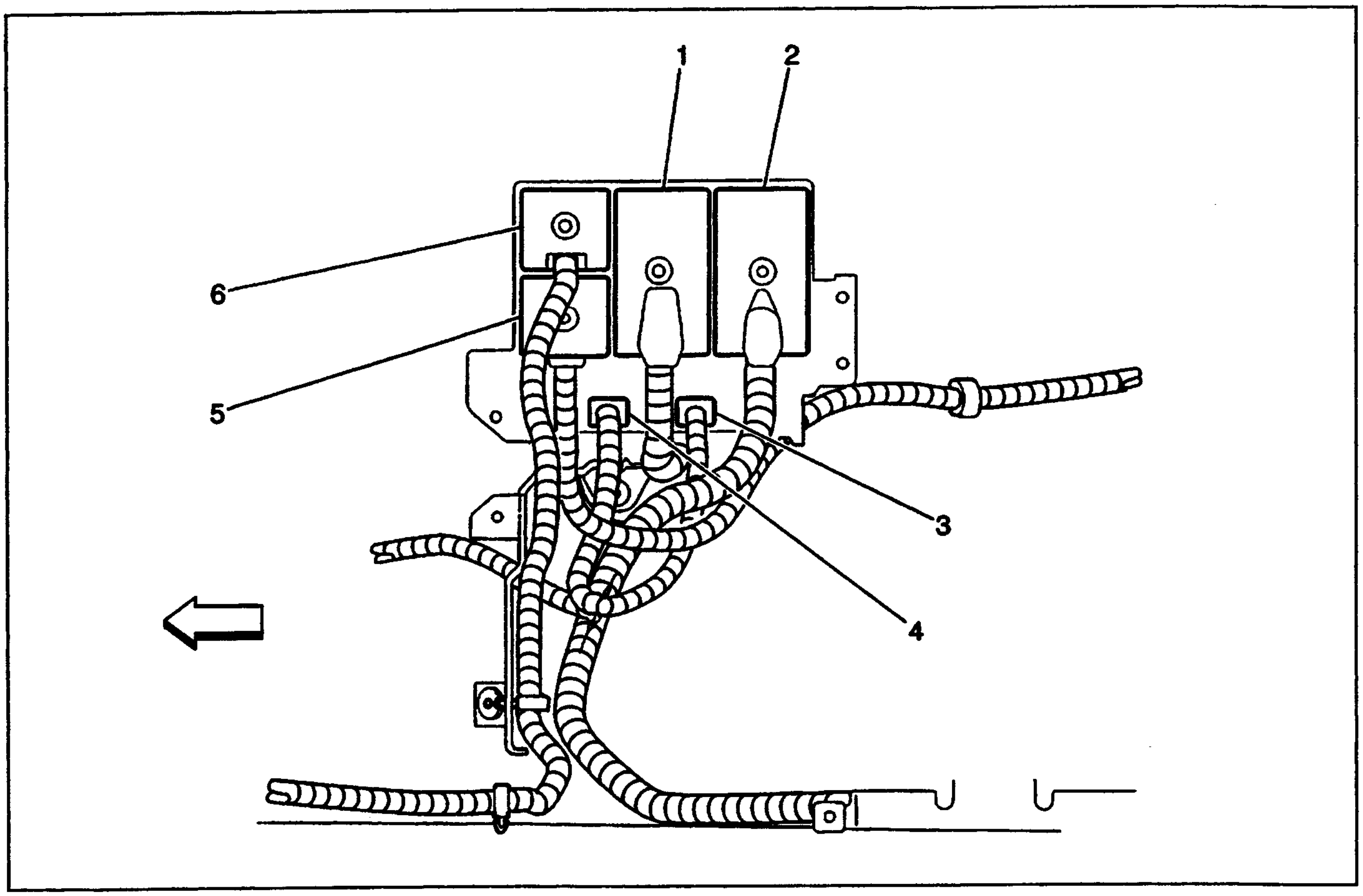


Figure 54

Legend

(1) Underhood Bussed Electical Center - C1
(2) Underhood Bussed Electical Center - C2
(3) Underhood Bussed Electical Center - C5
(4) Underhood Bussed Electical Center - C6
(5) Underhood Bussed Electical Center - C3
(6) Underhood Bussed Electical Center - C4

COMPONENT LOCATION VIEWS

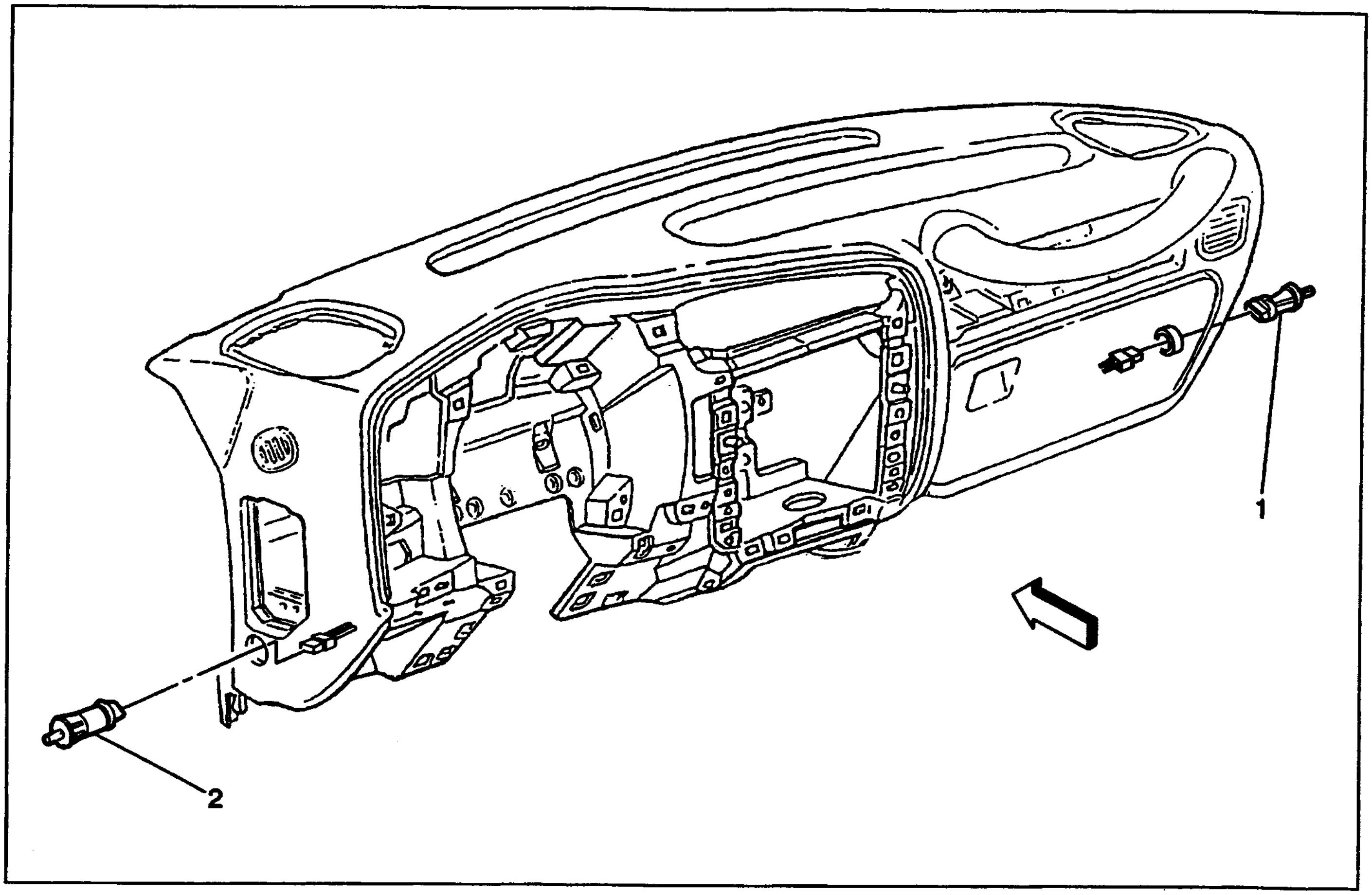


Figure 55

Legend

(1) Door Jamb Switch, RH

(2) Door Jamb Switch, LH

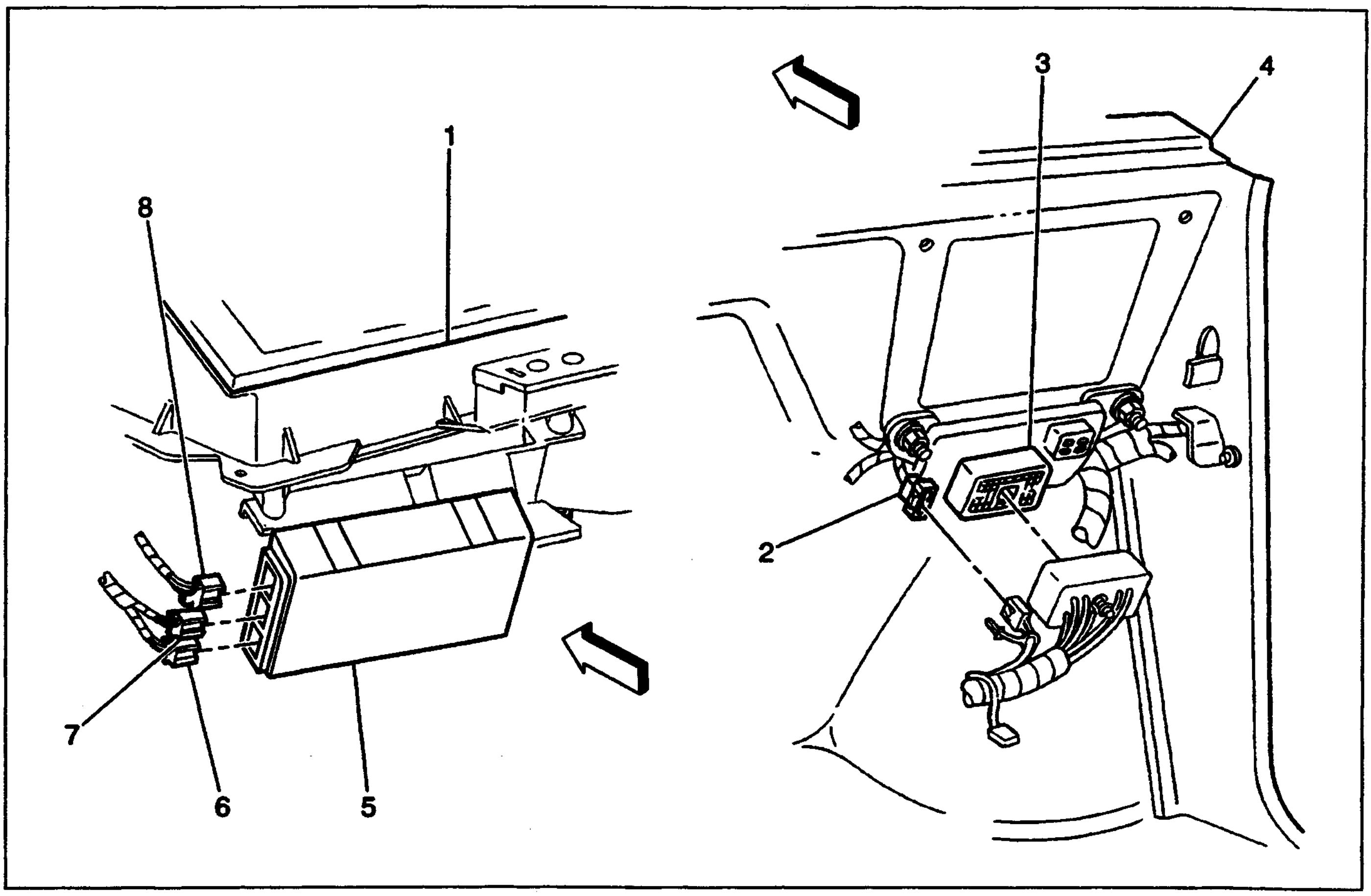


Figure 56

Legend

(1) Heater Controls	(5) Truck Body Control (TBC) Module
(2) C200	(6) Truck Body Control (TBC) Module - C1
(3) C203	(7) Truck Body Control (TBC) Module - C2
(4) Instrument Panel (IP)	(8) Truck Body Control (TBC) Module - C3

COMPONENT LOCATION VIEWS

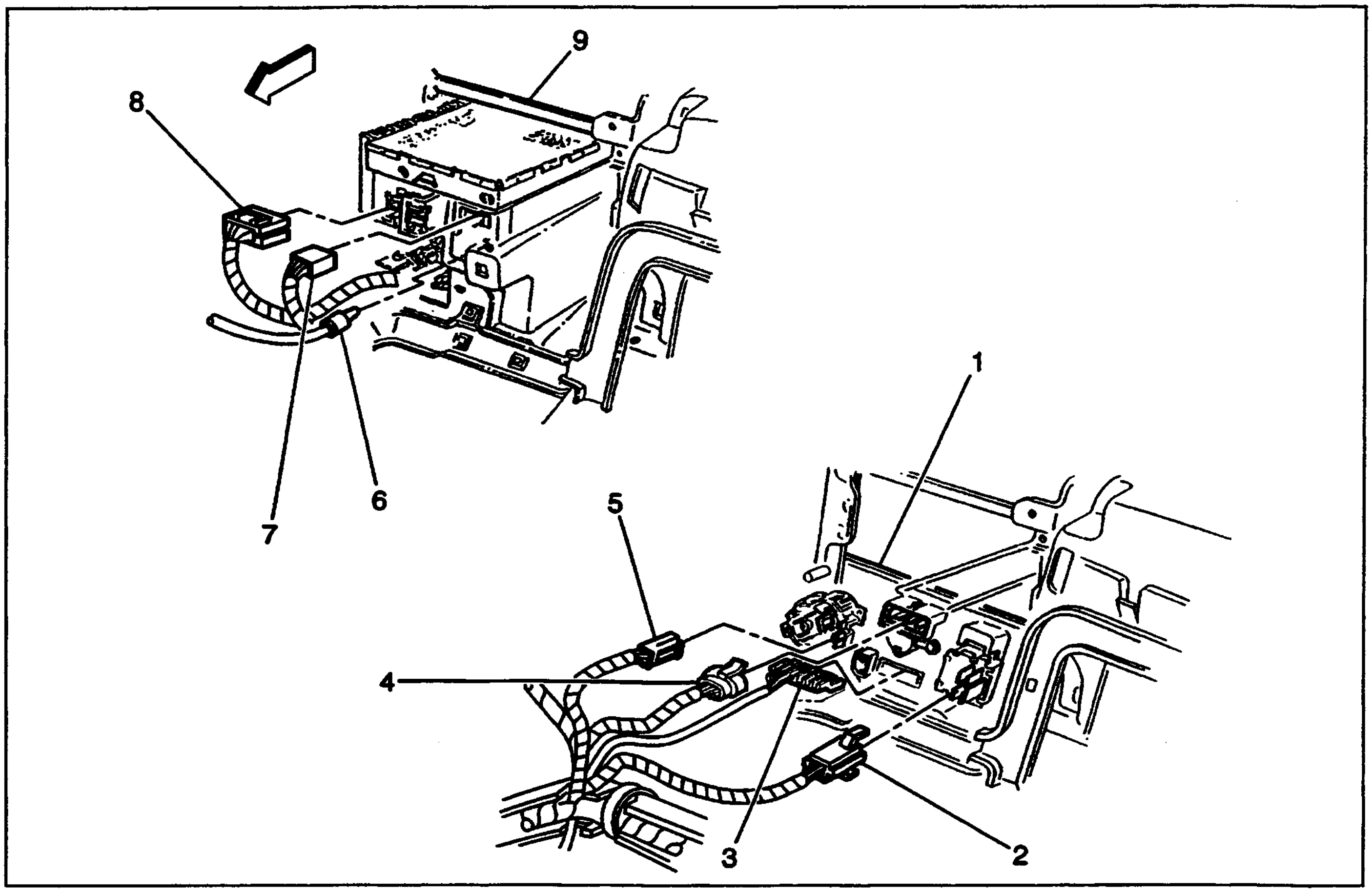


Figure 57

Legend

(1) HVAC Controls
(2) Window Defogger Switch Connector, Rear
(3) HVAC Controller Lamp Connector
(4) HVAC Controller - C1
(5) HVAC Controller - C2
(6) AM/FM Stereo Radio Antenna Cable
(7) AM/FM Stereo Radio - C2
(8) AM/FM Stereo Radio - C1
(9) AM/FM Stereo Radio

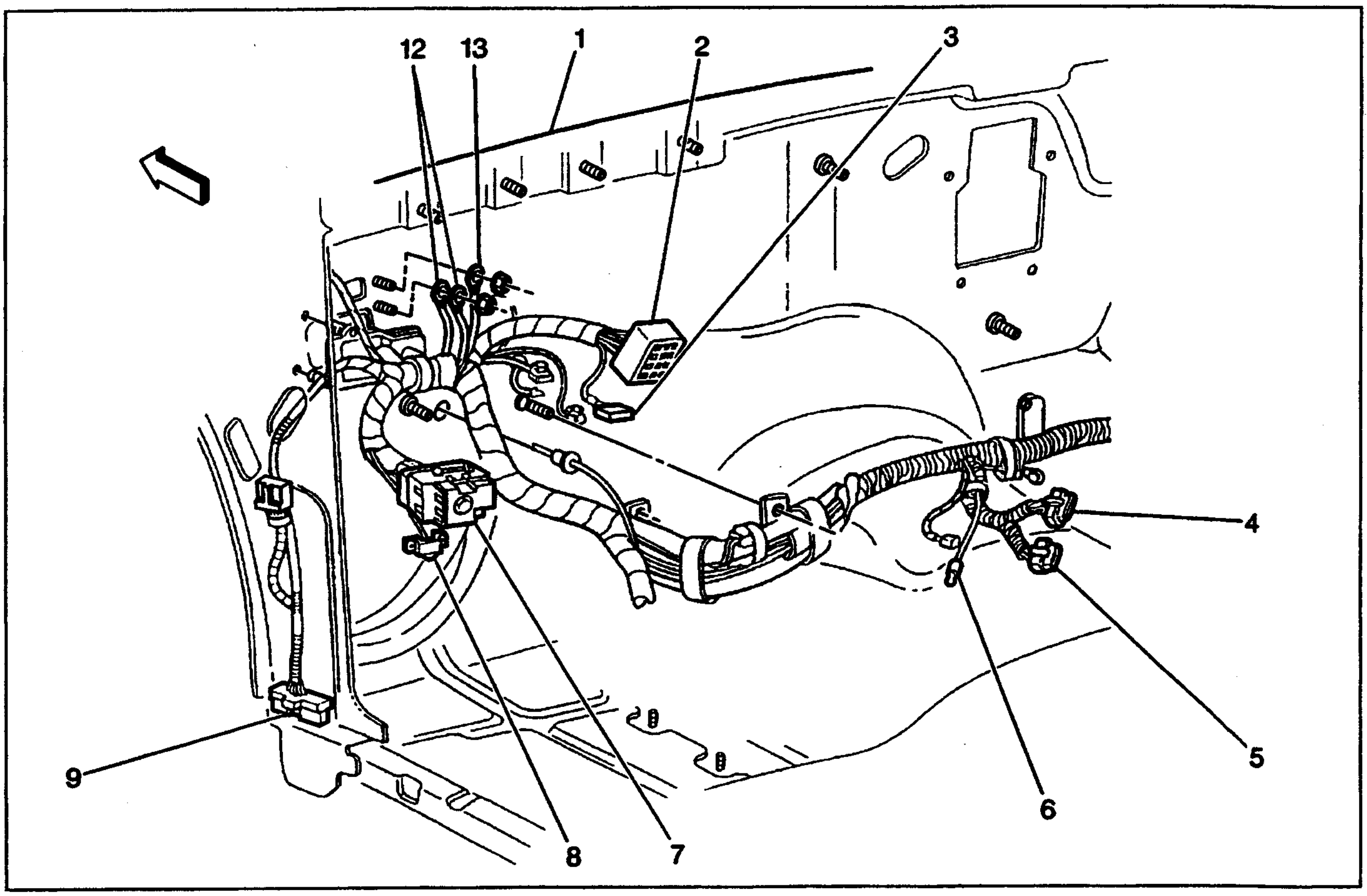


Figure 58

Legend

(1) IP
(2) Body Bussed Electrical Center
(3) SP202
(4) Truck Body Control (TBC) Module - C1
(5) Truck Body Control (TBC) Module - C2
(6) IP Vacuum Harness Connector
(7) C211
(8) SP201
(9) SP200
(12) G202
(13) G201

COMPONENT LOCATION VIEWS

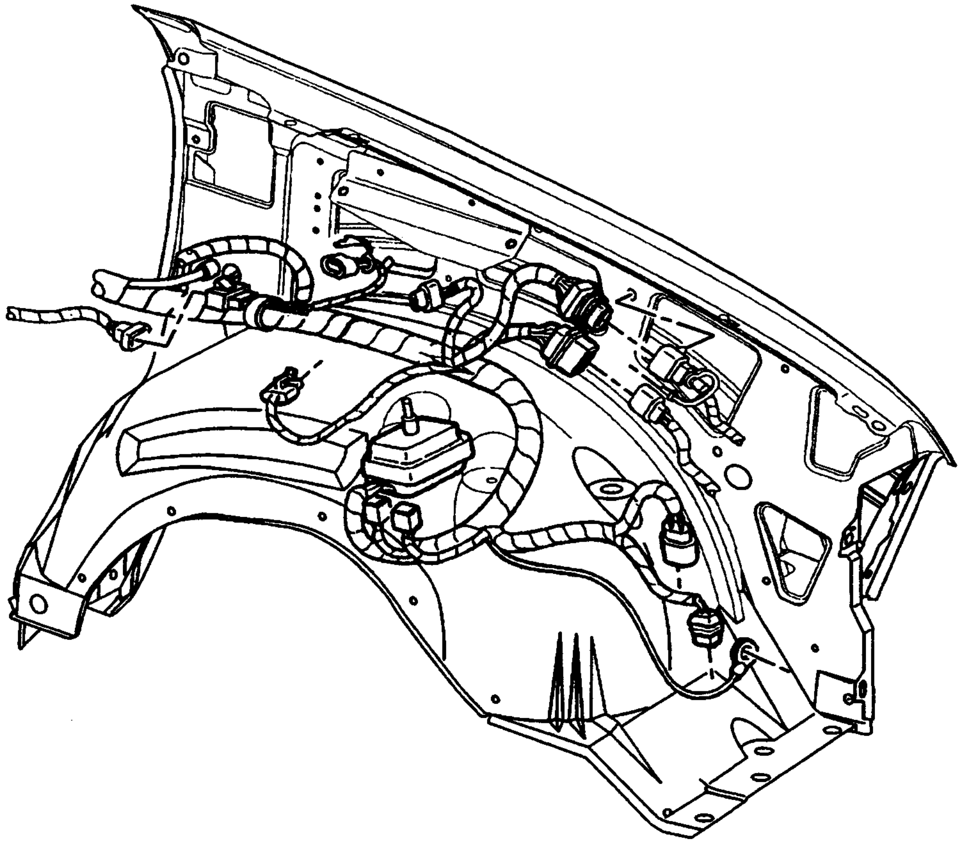


Figure 59

Legend

(1) Electronic Brake Control Module (EBCM) - C2
(2) Electronic Brake Control Module (EBCM) - C1
(3) Electronic Brake Control Module (EBCM) - C3
(4) C109
(5) G200
(6) Underhood Bussed Electrical Center (UBEC) - C1
(7) Underhood Bussed Electrical Center (UBEC) - C5
(8) Underhood Bussed Electrical Center (UBEC) - C6

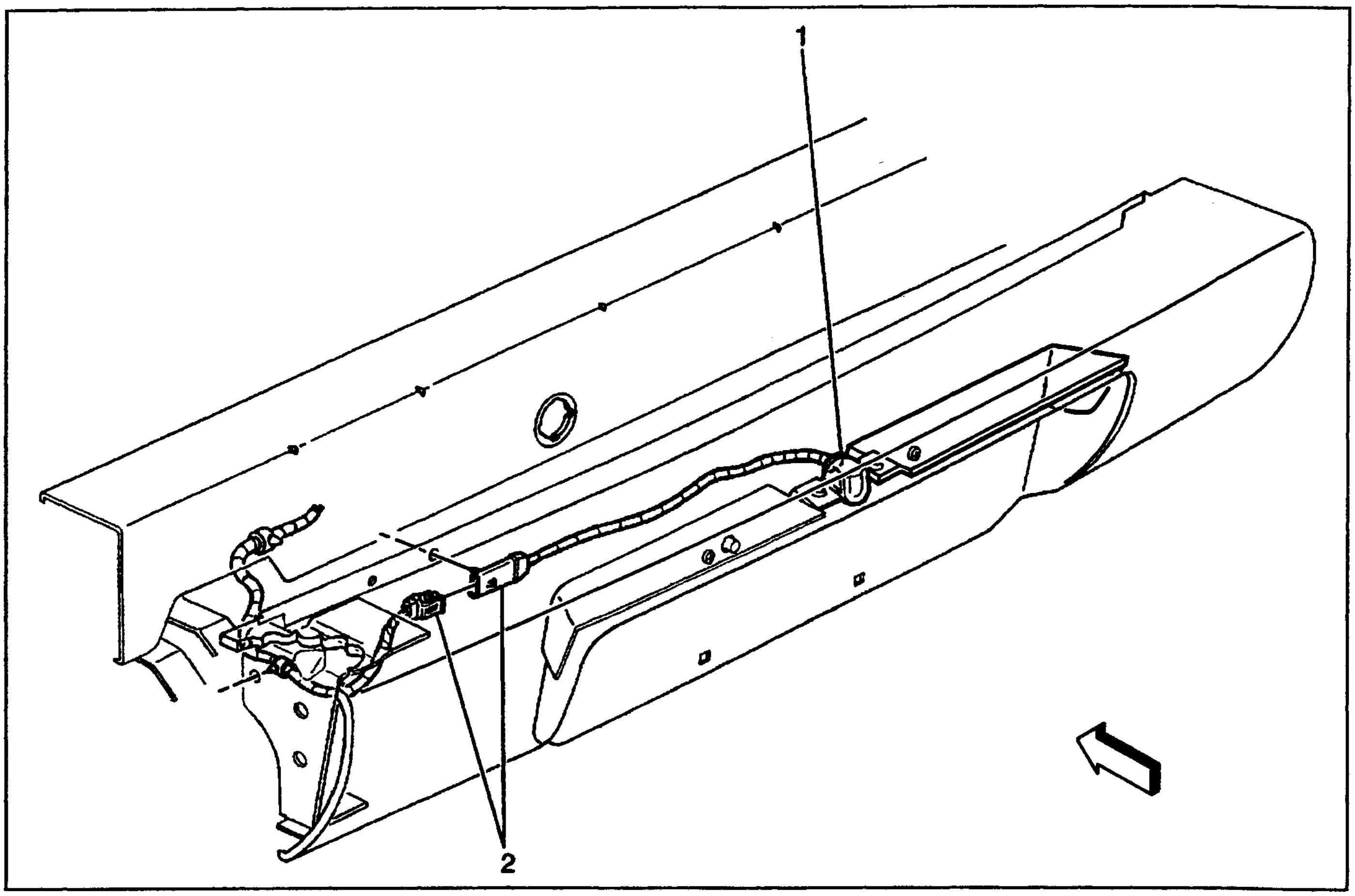


Figure 60

Legend

(1) License Lamp, RH

(2) License Lamp, LH

COMPONENT LOCATION VIEWS

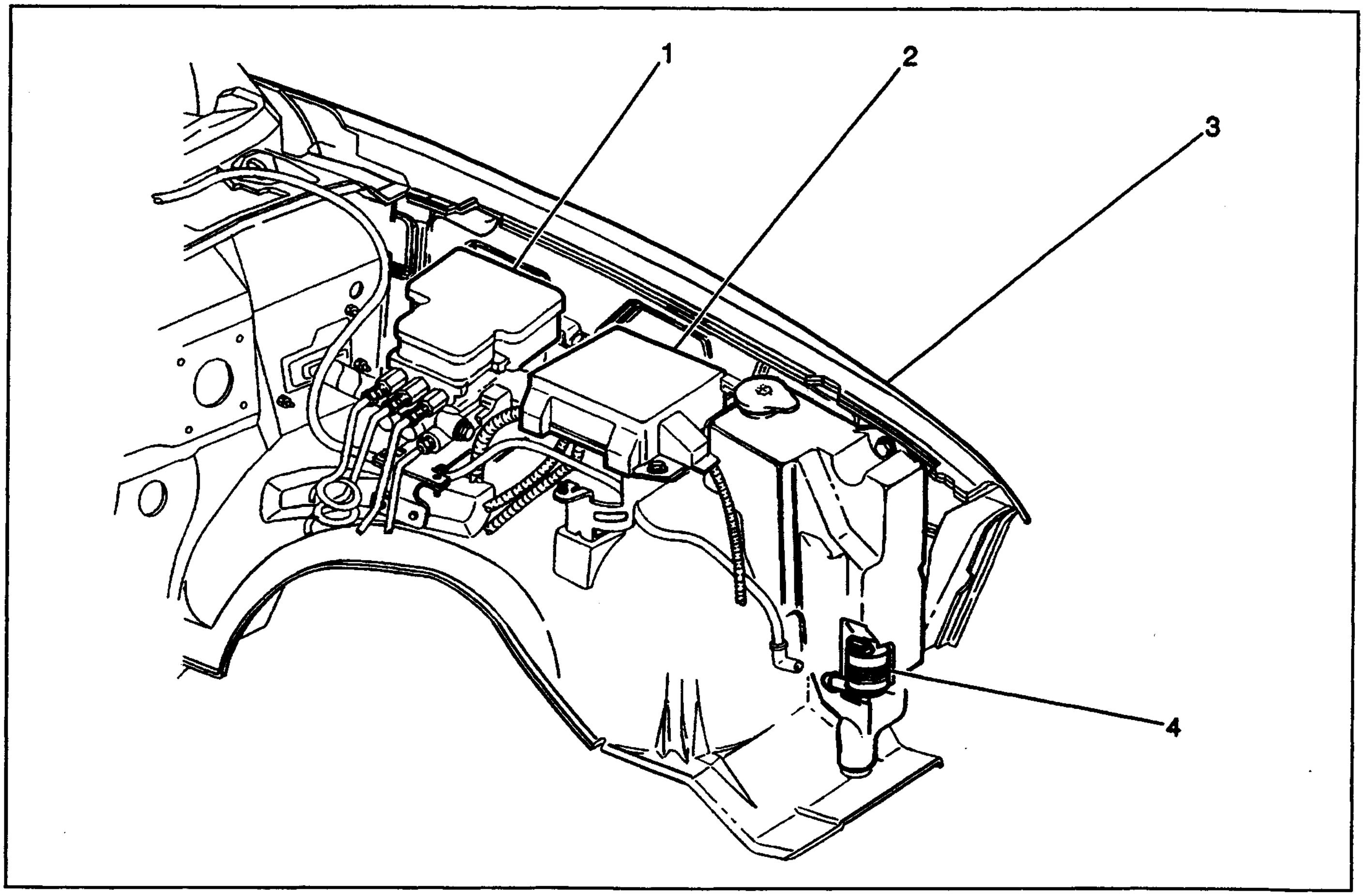


Figure 61

Legend

(1) Electric Body Control Module
(2) Underhood Bussed Electrical Center
(3) Fender, LF
(4) Window Washer Pump, Front

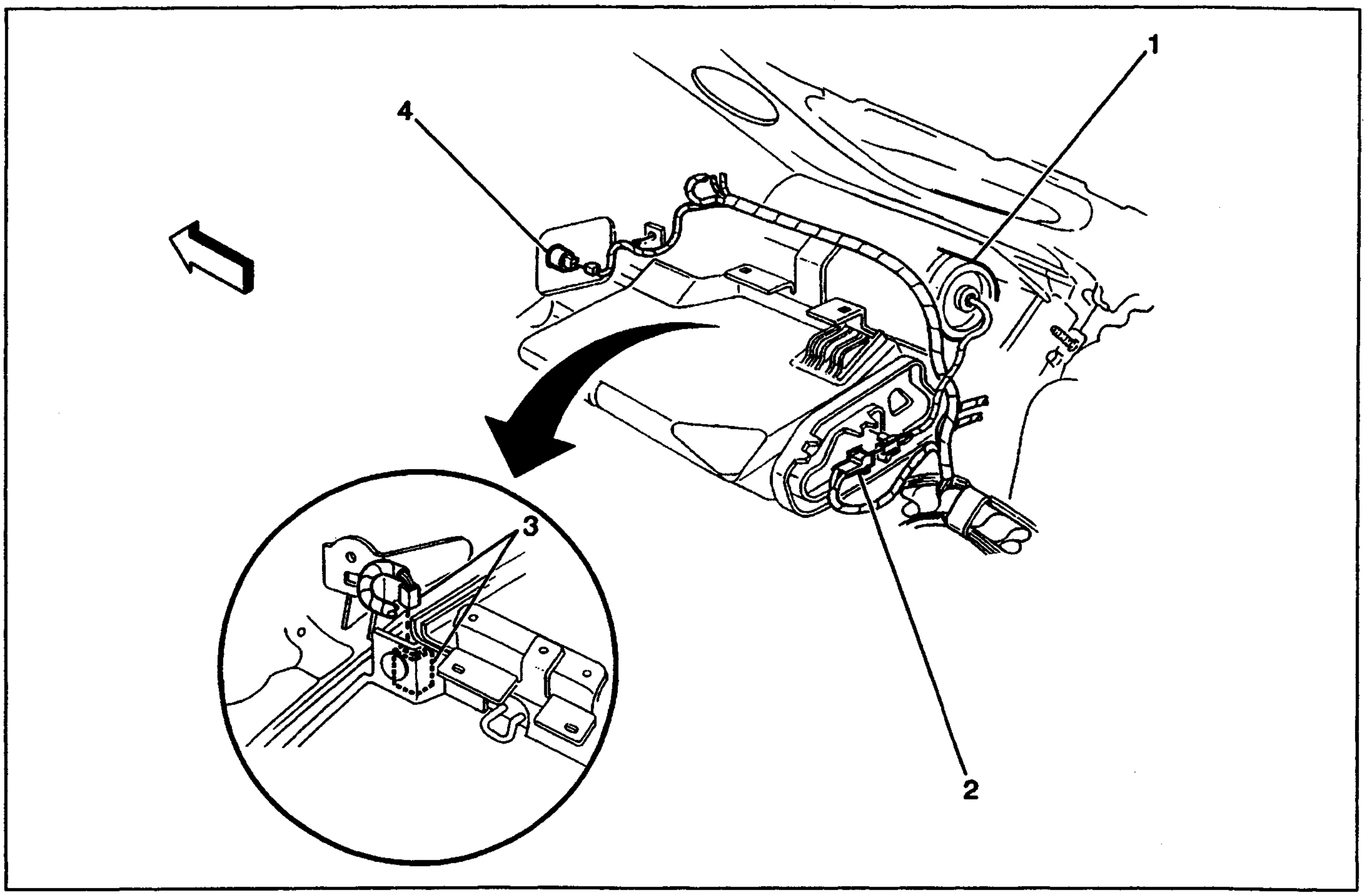


Figure 62

Legend

(1) Passenger Side Inflatable Restraint Inflator Module
(2) Passenger Side Inflatable Restraint Inflator Module Connectors
(3) IP Compartment Lamp
(4) Front Side Door Jamb Switch, RH

COMPONENT LOCATION VIEWS

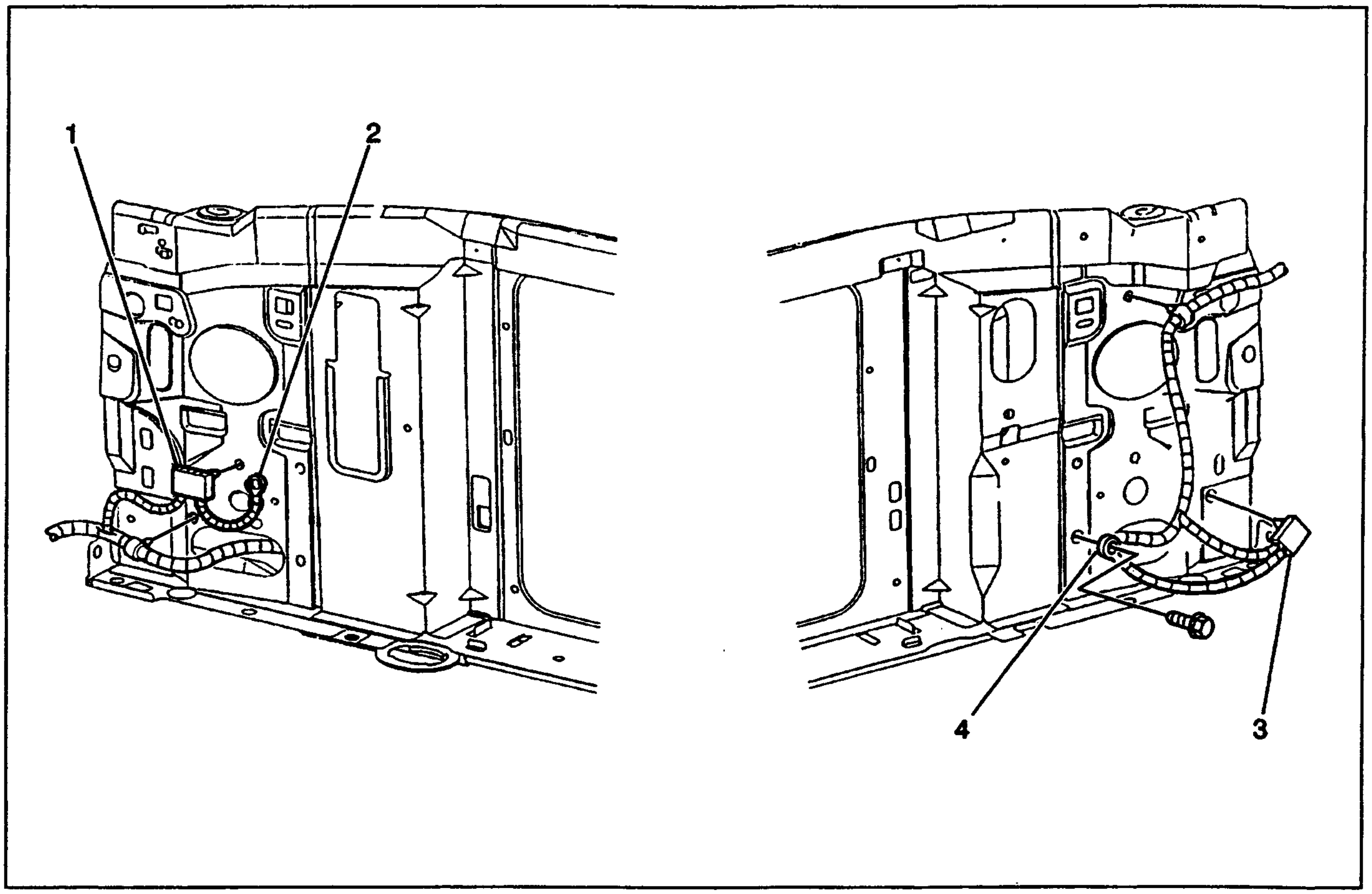


Figure 63

Legend

(1) SP100	(3) SP101
(2) G100	(4) G102

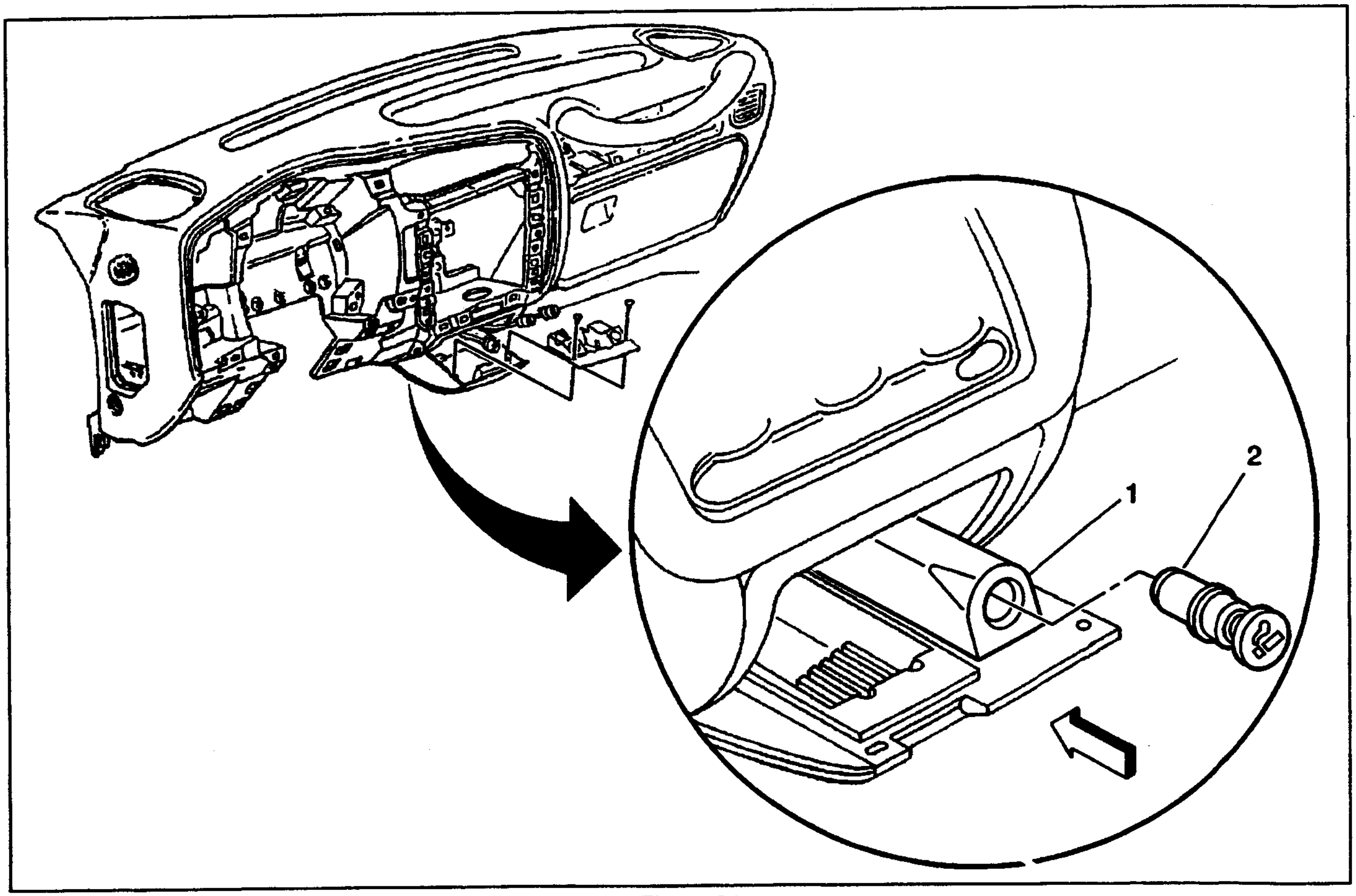


Figure 64

Legend

(1) Cigarette Lighter Housing

(2) Cigarette Lighter

COMPONENT LOCATION VIEWS

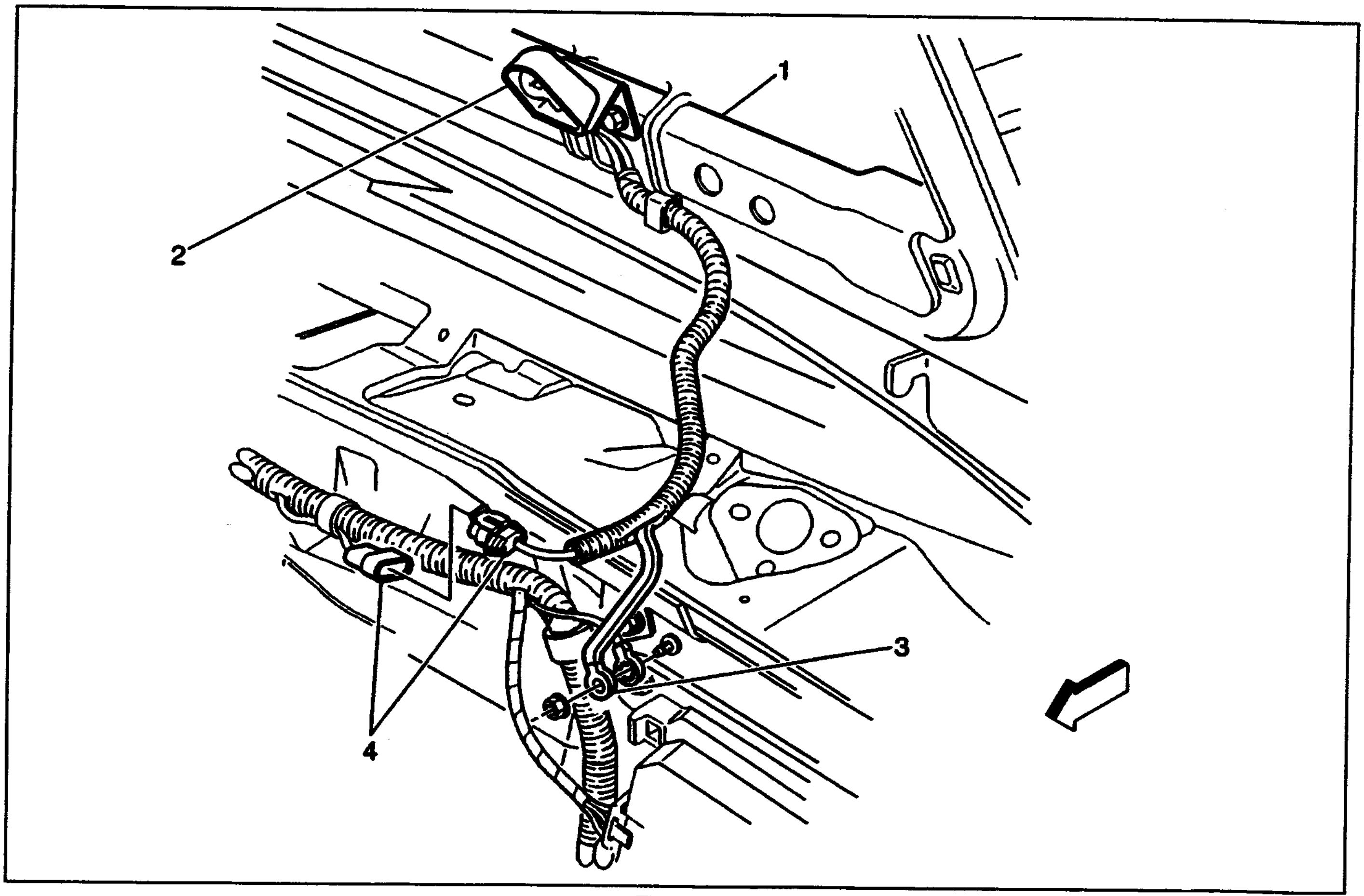


Figure 65

Legend

(1) Hood	(3) G120
(2) Underhood Lamp	(4) Underhood Lamp Connector

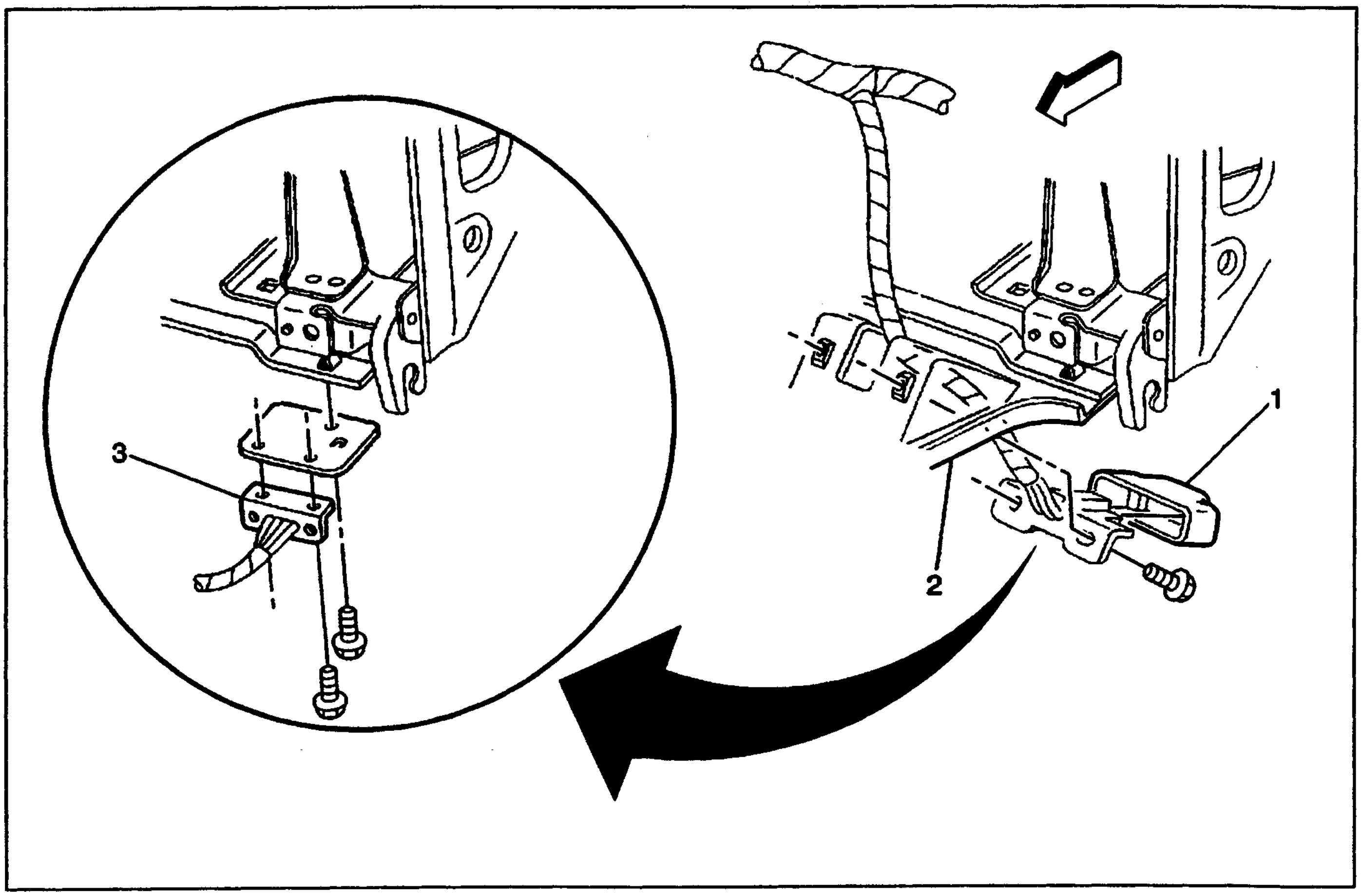


Figure 66

Legend

(1) Data Link Connector (DLC) Cover
(2) Driver's Side Kick Panel
(3) Data Link Connector (DLC)

COMPONENT LOCATION VIEWS

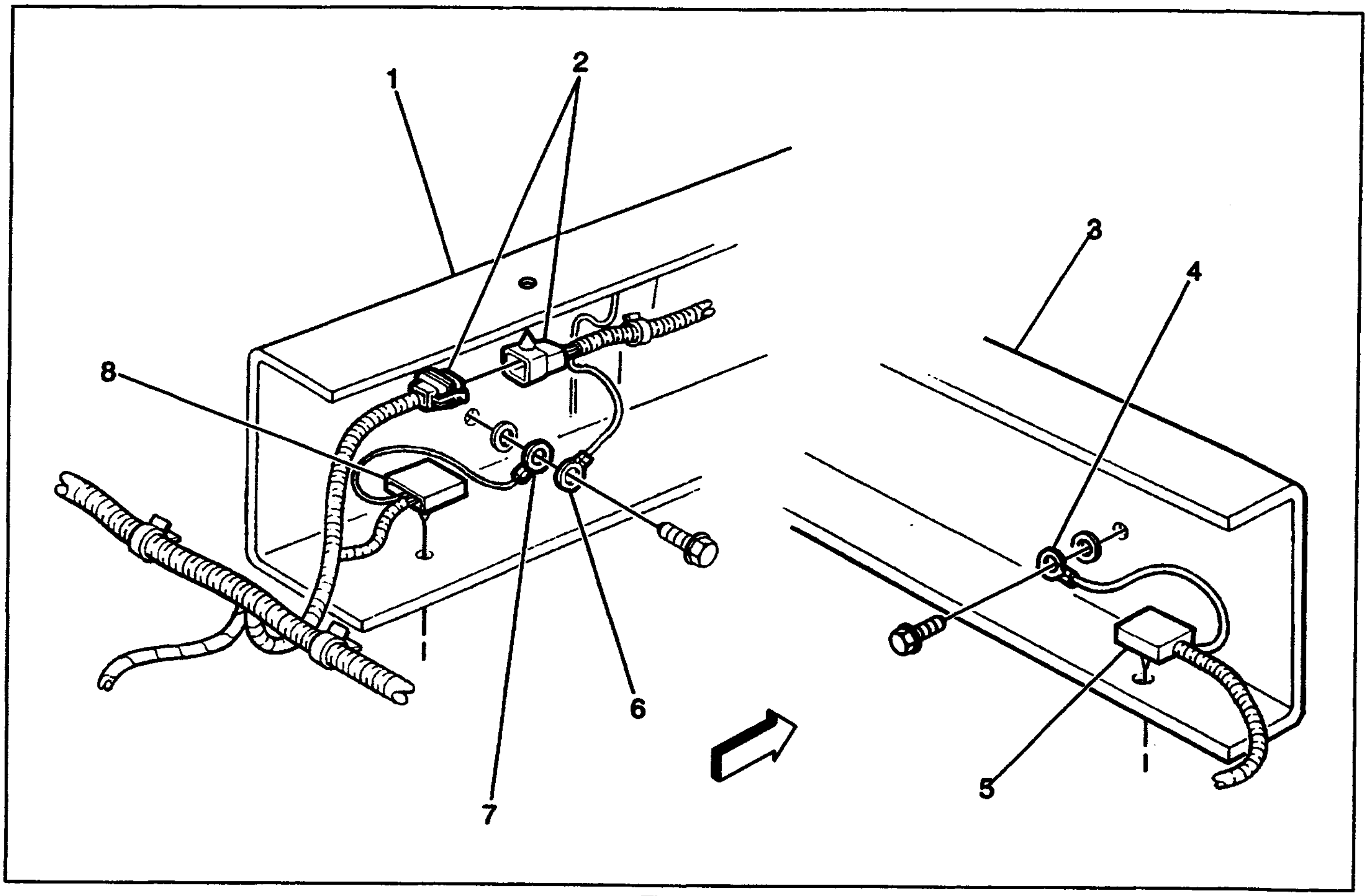


Figure 67

Legend

(1) Frame Rail, LR
(2) C400
(3) Frame Rail, RR
(4) G400
(5) SP401
(6) G401
(7) G402
(8) SP402

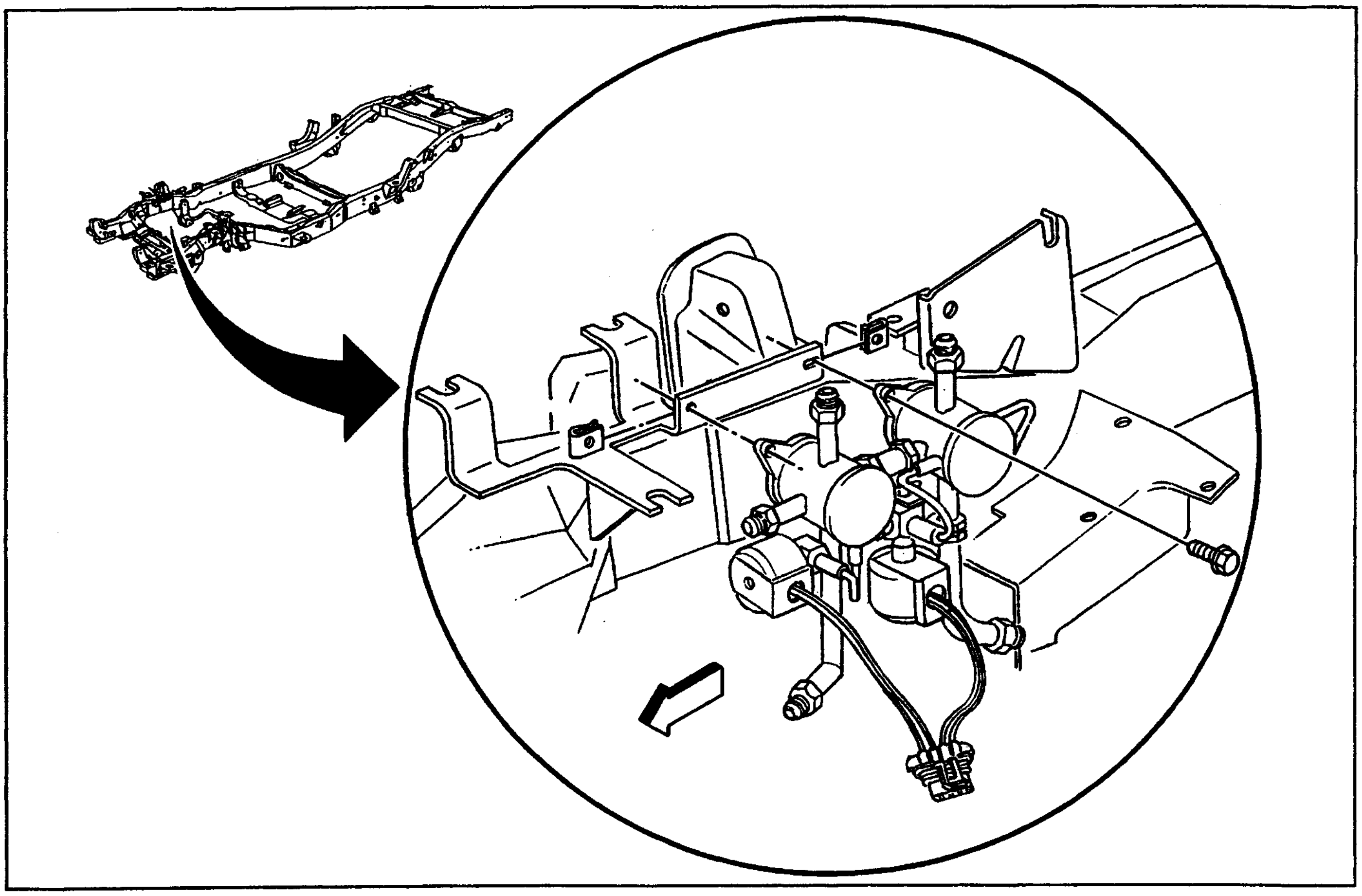


Figure 68

Legend

(1) Reversing Valve

(2) Primary Battery Valve

COMPONENT LOCATION VIEWS

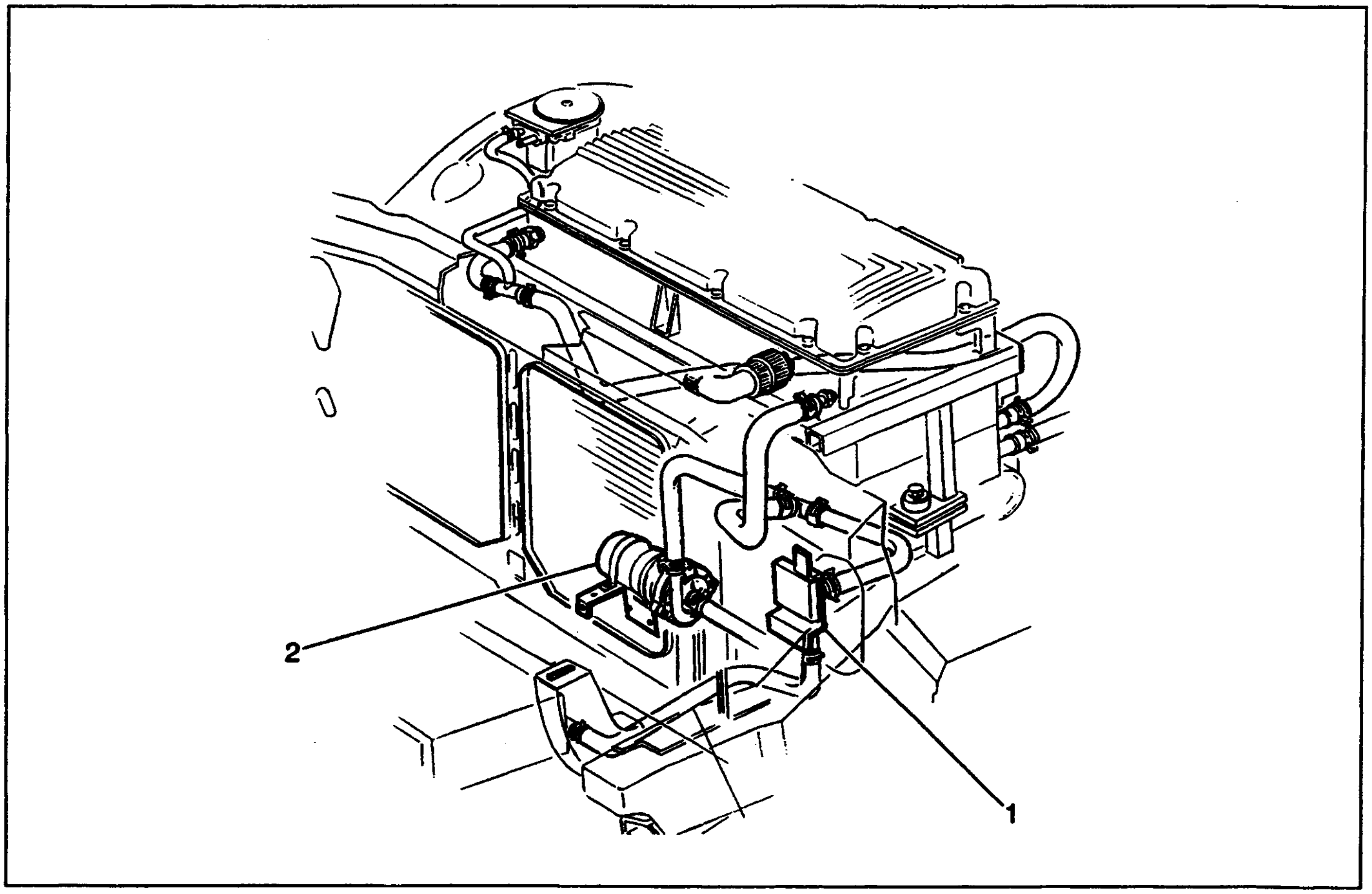


Figure 69

Legend

(1) Charge Port Coolant Valve

(2) Coolant Pump

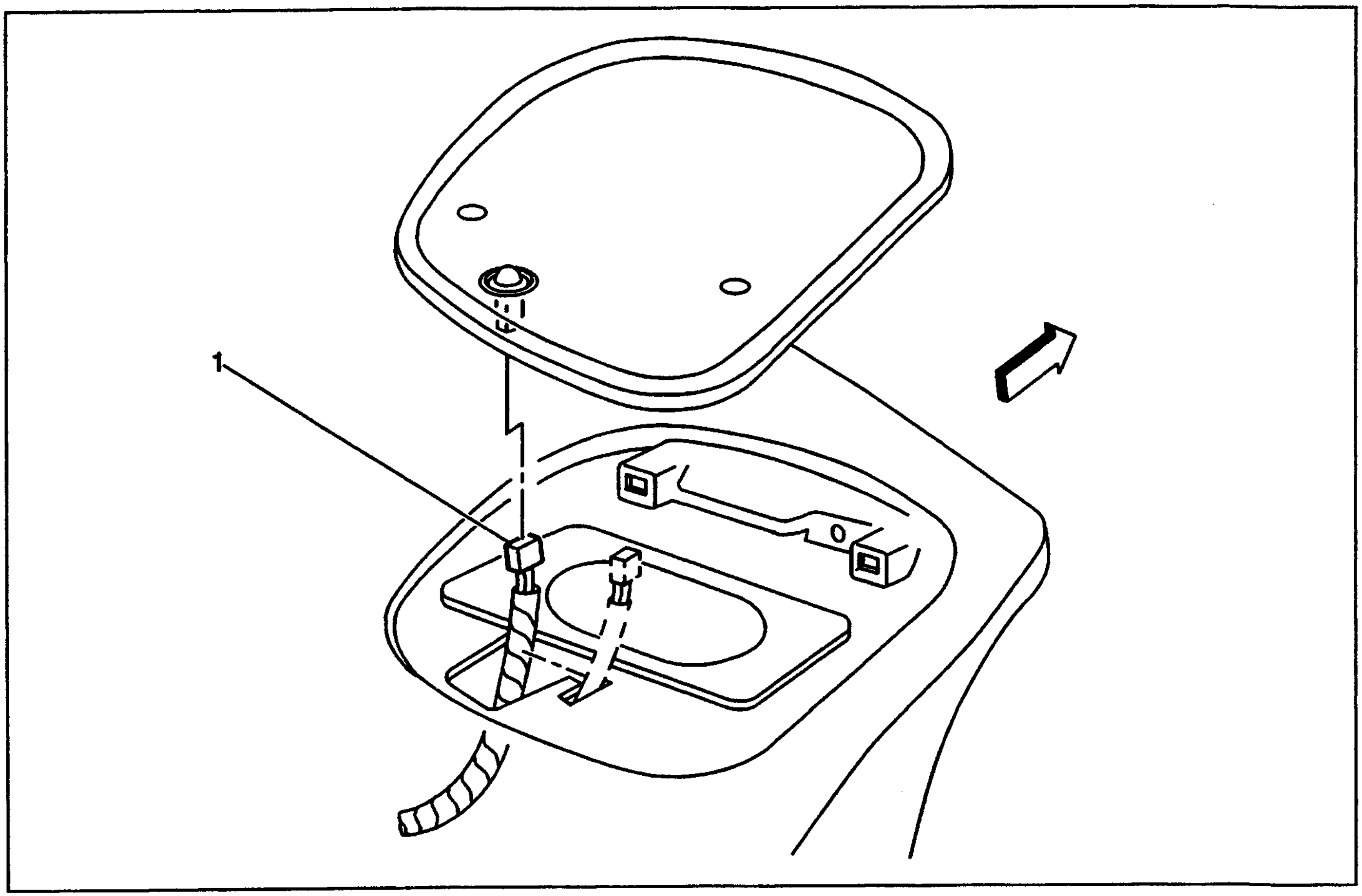


Figure 70

Legend

(1) Ambient Light Sensor

COMPONENT LOCATION VIEWS

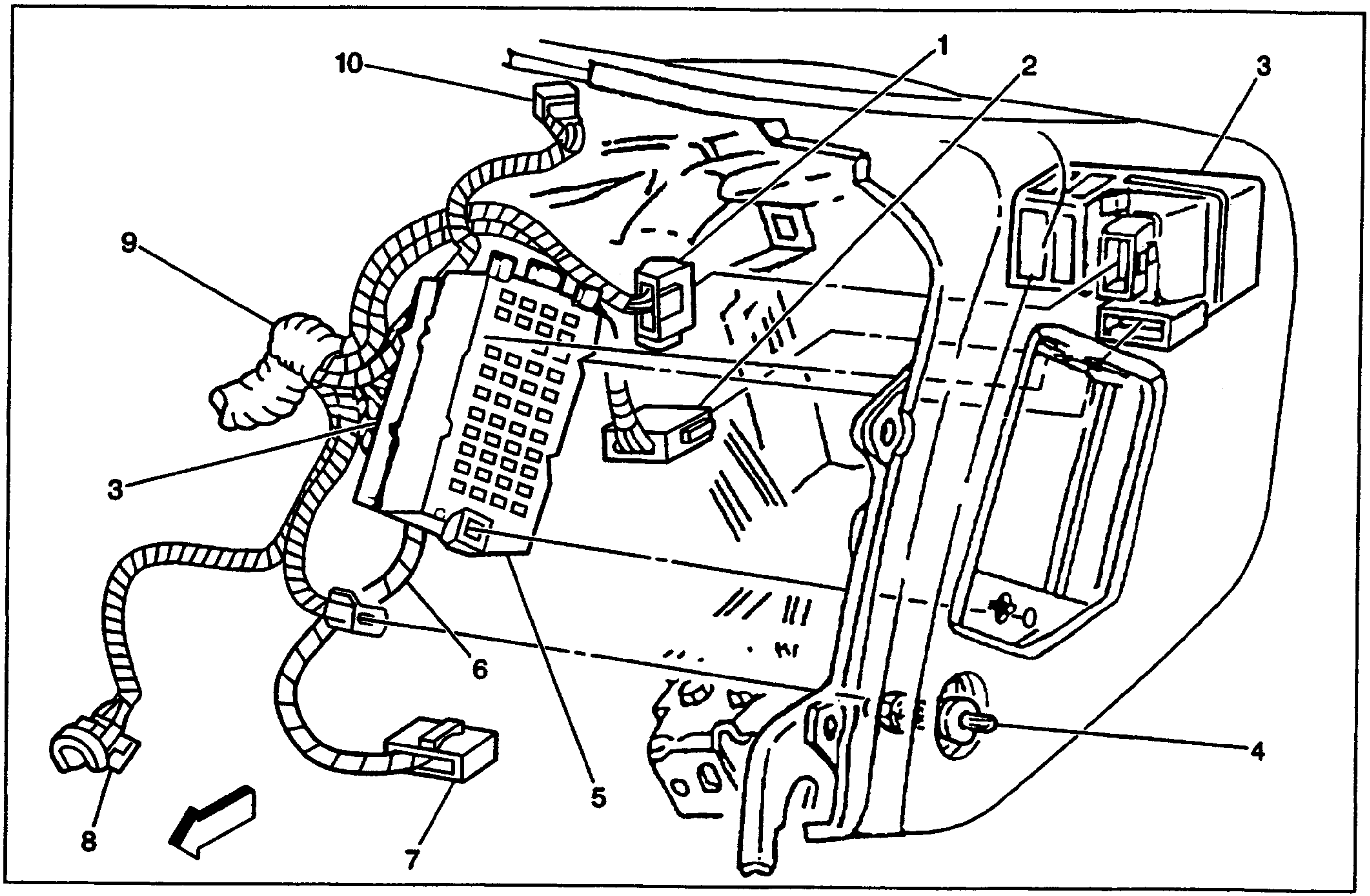


Figure 71

Legend

(1) Headlamp, Dome, and Parking Lamp Switch Connector
(2) Fog Lamp Switch Connector
(3) Headlamp Switch
(4) Door Jamb Switch, LF
(5) IP Fuse Block
(6) S204
(7) C217
(8) Courtesy Lamp, LF Console
(9) S223
(10) Speaker, LH IP

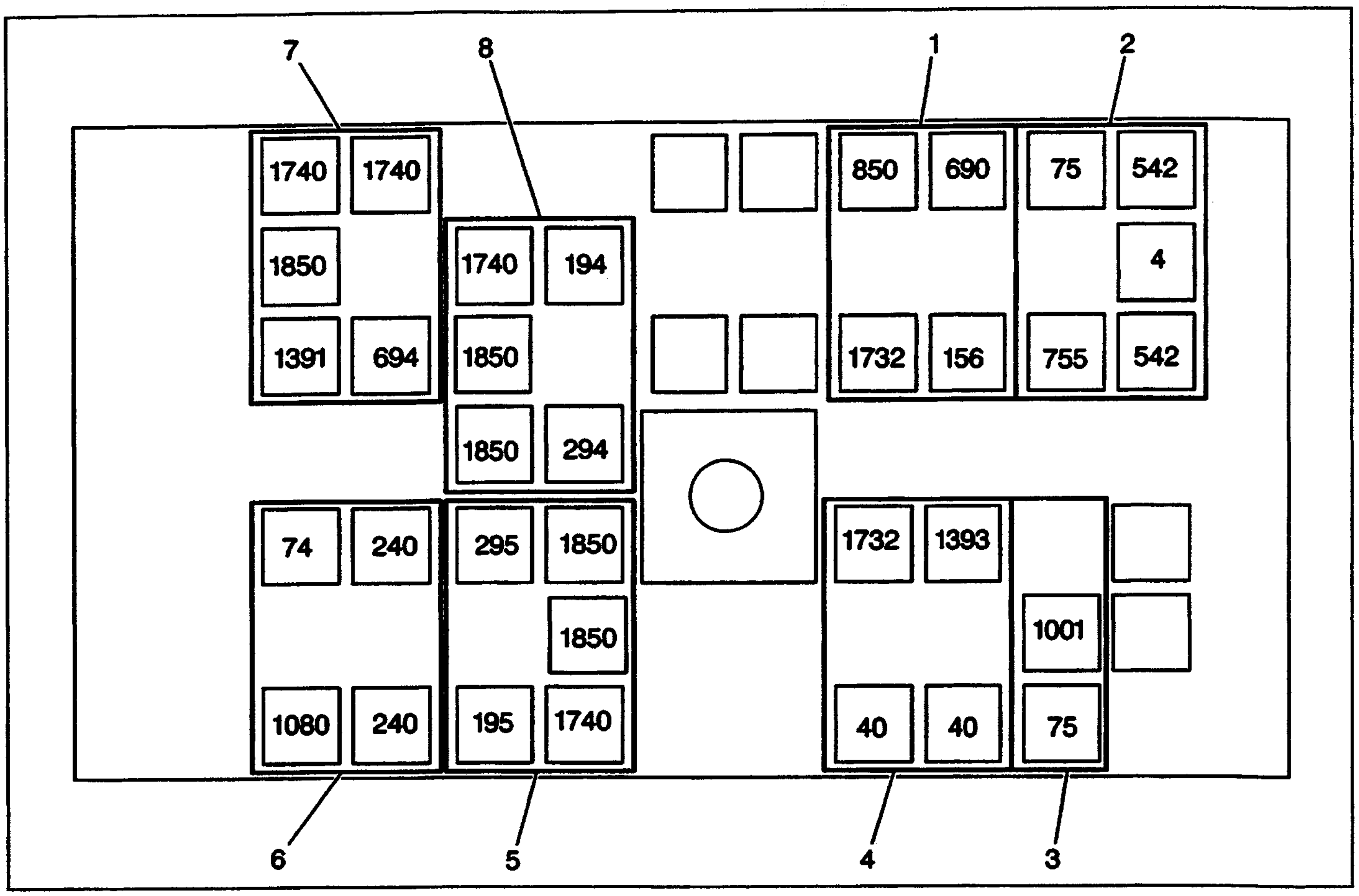

7
8
1
2
1740
1740
1850
1391
694
1740
194
1850
1850
294
850
690
1732
156
75
542
4
755
542
74
240
1080
240
295
1850
1850
195
1740
1732
1393
40
40
1001
75
6
5
4
3

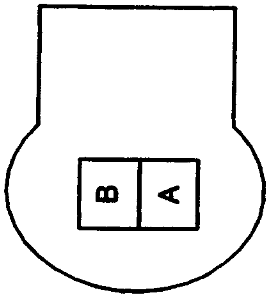
Figure 72

Legend

(1) Courtesy Lamp Relay
(2) Retained Accessory Power Relay
(3) Power Window Circuit Breaker
(4) Inadvertent Power Lamp Relay
(5) Door Lock Relay
(6) Park Lamp Relay
(7) Door Unlock Relay
(8) Driver's Door Unlock Relay

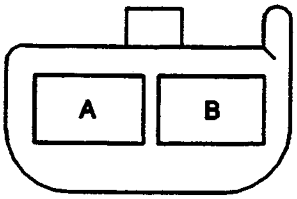
CONNECTOR END VIEWS

Ambient Air Temperature Sensor



Connector Part Information		• 12162194 • 2 Way F Metri-Pack 150.2 Series Pull To Seat Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT GRN/BLK	735	Outside Ambient Temperature Sensor Signal
B	BLK/WHT	451	PCM Ground

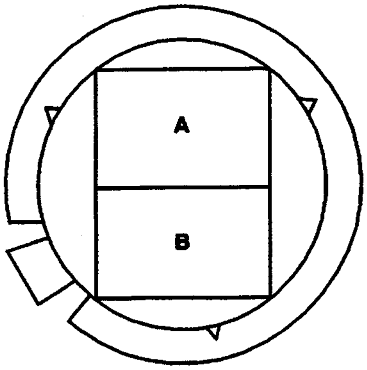
Ambient Light Sensor



Connector Part Information		• 12047662 • 2 Way F Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	GRY	705	Ambient Light Sensor
B	WHT	278	Photocell Signal

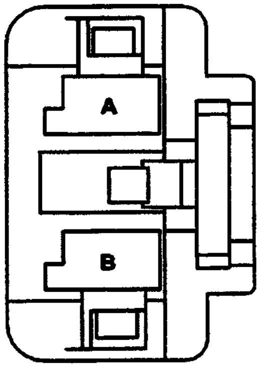
CONNECTOR END VIEWS

Ashtray Lamp



Connector Part Information		• 12124722 • 2 Way F Lamp Socket Wedge Base Type W-2 (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2409	Park Lamps
B	BLK	1050	Ground

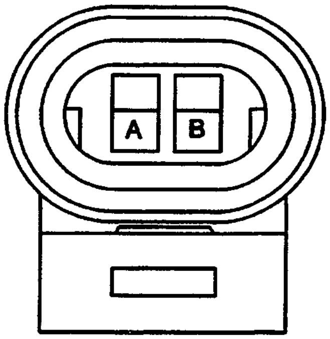
Auxiliary Heater (FFH) Service Port



Connector Part Information		• 12066681 • 2 Way F Metri-Pack 630 Pull To Seat (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	PNK	904	
B	PNK	39	IGN 1

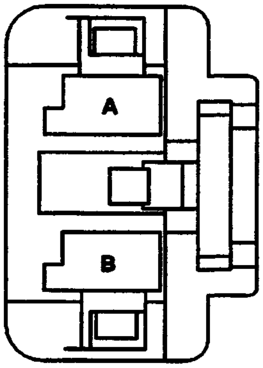
CONNECTOR END VIEWS

Battery Pack Air Flow Sensor



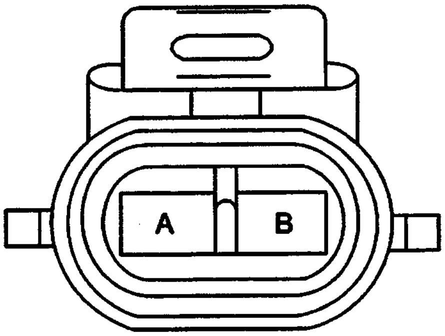
Connector Part Information		• 12162198 • 2 Way F Metri-Pack 150.2 Series Pull To Seat (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	5620	Accessory Power Module Output Command
B	YEL	492	Air Flow Sensor

Blower Motor



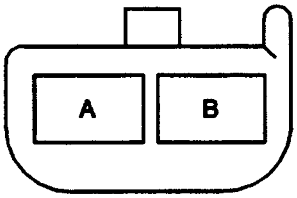
Connector Part Information		• 12066681 • 2 Way F Metri-Pack 630 Series Pull To Seat (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	PPL	65	Blower Motor Feed
B	BLK	850	Ground

Brake Pressure Warning Switch



Connector Part Information		• 12052646 • 2 Way F Metri-Pack 150 Series Sealed (White)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	350	Ground
B	PPL	680	ABS Pressure Differential Sensor Signal

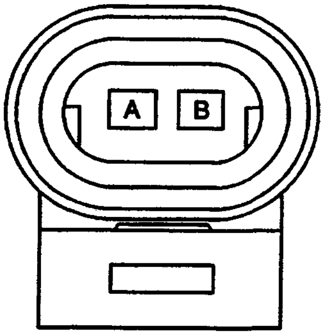
Brake Transmission Shift Interlock (BTSI) Actuator



Connector Part Information		• 12047662 • 2 Way F Metri-Pack 150 Series Sealed (White)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN/WHT	1135	Brake Transmission Shift Interlock Solenoid Feed
B	BLK	150	Ground

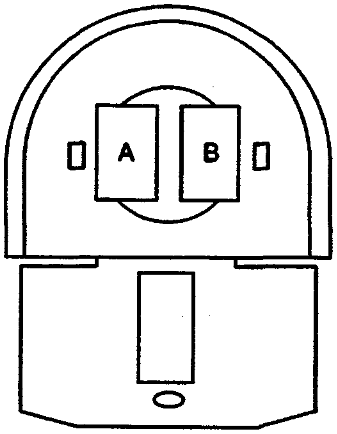
CONNECTOR END VIEWS

Coolant Temp Sensor



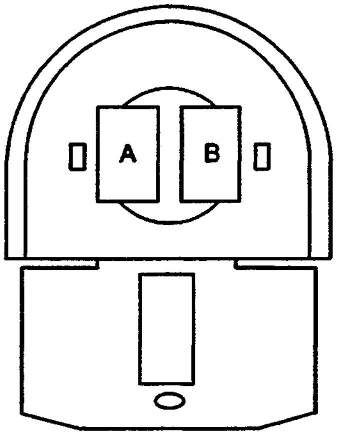
Connector Part Information		• 12162194 • 2 Way F Metri-Pack 150.2 Pull To Seat Sealed (Black)	
Pin	Wire Color	Circuit No	Function
A	BLK/WHT	451	PCM Ground
B	YEL	410	Coolant Temperature Sensor Signal

Courtesy Lamp, LH



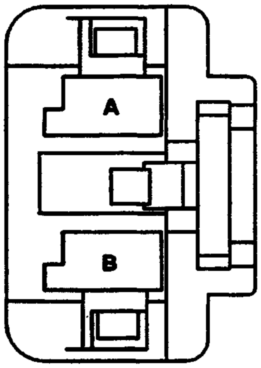
Connector Part Information		• 12162285 • 2 Way F Lamp Socket Wedge Base W2 (Gray)	
Pin	Wire Color	Circuit No	Function
A	ORN	40	Fused Output Battery
B	WHT	156	Courtesy Lamp Output

Courtesy Lamp, RH



Connector Part Information		• 12162285 • 2 Way F Lamp Socket Wedge Base W2 (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	40	Fused Output Battery
B	WHT	156	Courtesy Lamp Output

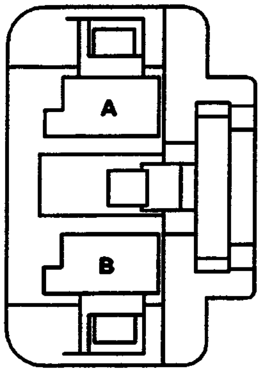
Door Speaker, LH



Connector Part Information		• 12052832 • 2 Way F Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL	116	Speaker Return Rear
B	BRN	199	Speaker Feed Rear

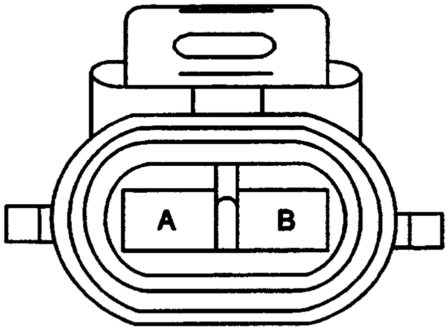
CONNECTOR END VIEWS

Door Speaker, RH



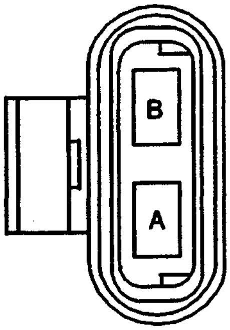
Connector Part Information		• 12052832 • 2 Way F Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	115	Speaker Return Rear
B	DK BLU	46	Speaker Feed Rear

Drive Motor Winding Temperature Sensor



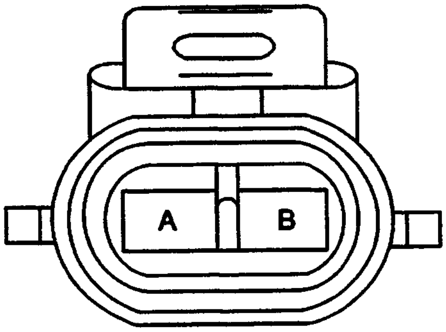
Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series Sealed (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN	37	Motor Winding Temperature
B	PNK	1798	Motor Winding Temperature Sensor Return

Electronic Brake Control Module (EBCM) C3



Connector Part Information		• 12085030 • 2 Way F Metri-Pack 630 Series Pull To Seat (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	442	Fused Output Battery
B	BLK	150	Ground

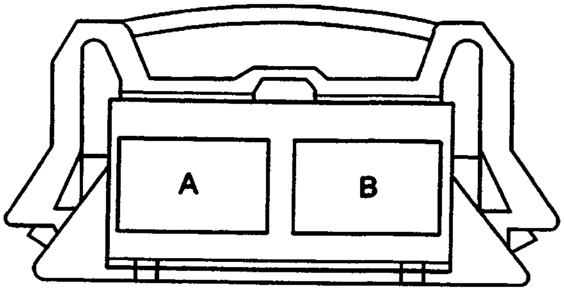
Fuel Level Sensor



Connector Part Information		• 12052641 • 2 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	50	Ground
B	PPL	30	Fuel Gauge Sensor Return

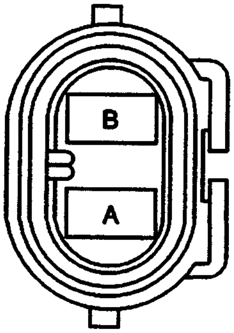
CONNECTOR END VIEWS

Fuel Pump



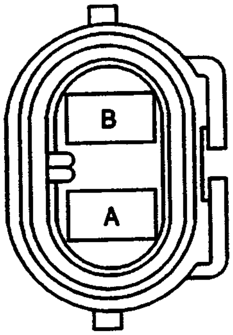
Connector Part Information		• 12129140 • 2 Way F Metri-Pack 280.1 Pull To Seat (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	GRY	120	Fuel Pump Motor Feed
B	BLK	50	Ground

Headlamp, High Beam, LH



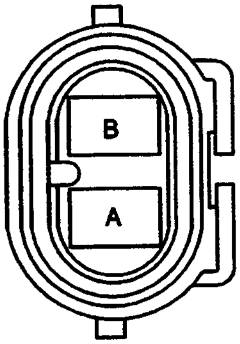
Connector Part Information		• 12059183 • 2 Way F Metri-Pack 280 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN/WHT-YEL/BLK	711/712	High/Low Headlamp Feed
B	PPL	524	Hi Beam

Headlamp, High Beam, RH



Connector Part Information		• 12059183 • 2 Way F Metri-Pack 280 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK BLU	198	Fused Output Headlamp
B	PPL	524	Hi Beam

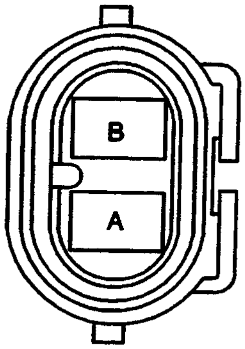
Headlamp, Low Beam, LH



Connector Part Information		• 12059181 • 2 Way F Metri-Pack 280 Series Sealed ((Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL/BLK	712	Low Headlamp Feed
B	YEL	525	Headlamp Switch Output Low Beam

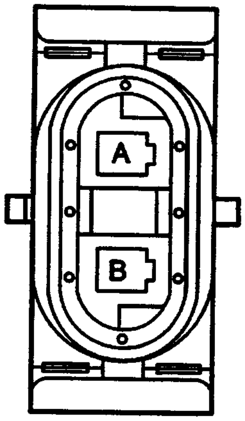
CONNECTOR END VIEWS

Headlamp, low Beam, RH



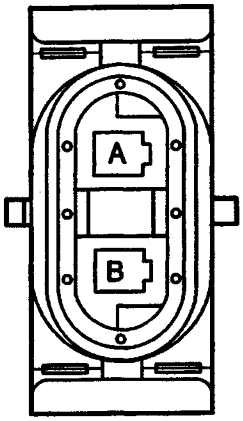
Connector Part Information		• 12059181 • 2 Way F Metri-Pack 280 Series Sealed (Gray)	
Pin	Wire Color	Circuit No	Function
A	DK BLU	198	Fused Output Headlamp
B	YEL	525	Headlamp Switch Output Low Beam

High Voltage Disconnect Relay-K1



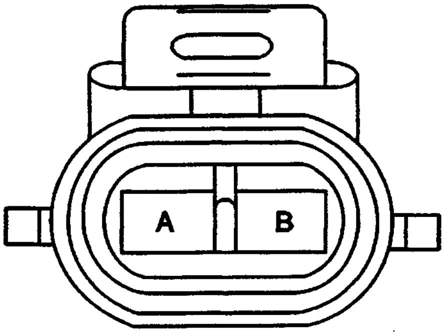
Connector Part Information		• 12162017 • 2 Way F Metri-Pack 150 Series (Gray)	
Pin	Wire Color	Circuit No	Function
A	YEL	917	Ground
B	GRY	916	Horn Feed

High Voltage Disconnect Relay-K2



Connector Part Information		• 12162017 • 2 Way F Metri-Pack 150 Series (Gray)	
Pin	Wire Color	Circuit No	Function
A	RED	905	CM Interlock Return
B	LT BLU/BLK	918	Horn Feed

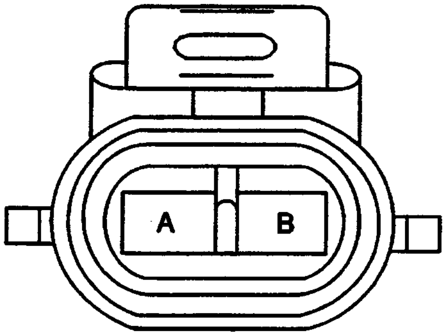
Horn, LH



Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series (Gray)	
Pin	Wire Color	Circuit No	Function
A	BLK	150	Ground
B	DK GRN	1329	Horn Feed

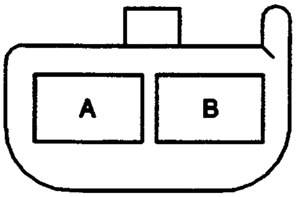
CONNECTOR END VIEWS

Horn, RH



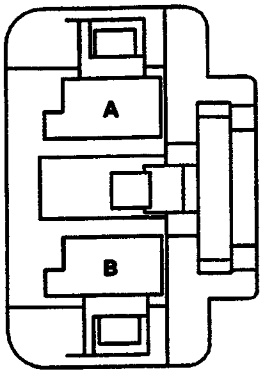
Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	250	Ground
B	DK GRN	1329	Horn Feed

IP Compartment Lamp



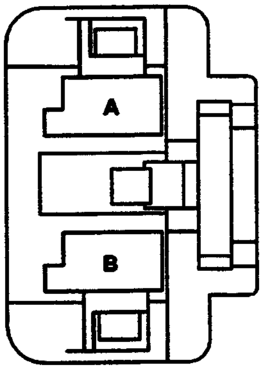
Connector Part Information		• 12047662 • 2 Way F Metri-Pack 150 series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	1732	Interior Lamp Request
B	BLK	1050	Ground

IP Speaker LH



Connector Part Information	• 12052832 • 2 Way F Metri-Pack 150 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**
A	GRY	118	Speaker Return Front
B	TAN	201	Speaker Feed Front

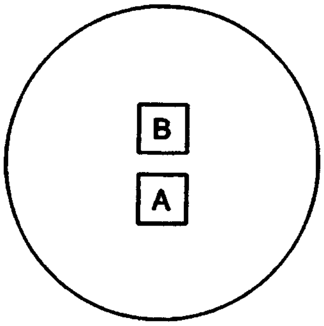
IP Speaker RH



Connector Part Information	• 12052832 • 2 Way F Metri-Pack 150 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN	117	Speaker Return Front
B	LT GRN	200	Speaker Feed Front

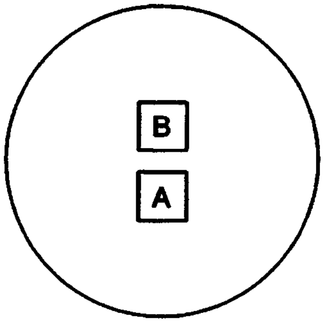
CONNECTOR END VIEWS

License Lamp, LH



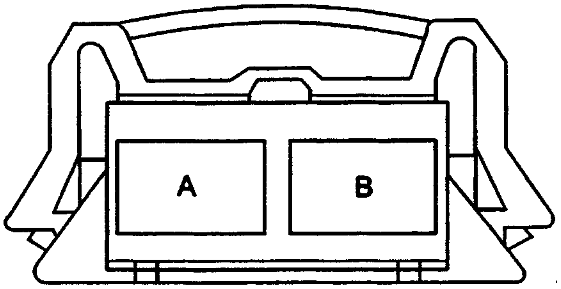
Connector Part Information		• 12110053 • 2 Way F Asm, Lamp Socket Wedge Base Type W-2 (Lt. Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2509	Park Lamp Feed
B	BLK	1750	Ground

License Lamp, RH



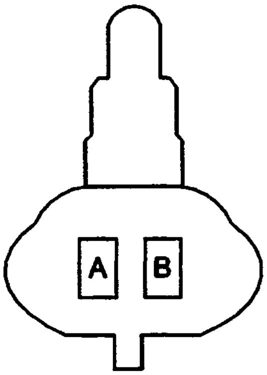
Connector Part Information		• 12110053 • 2 Way F Asm, Lamp Socket Wedge Base Type W-2 (Lt. Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	2250	Ground
B	BRN/WHT	2609	Park Lamp Feed

P/B Booster Vacuum Pump



Connector Part Information		• 12129140 • 2 Way F Metri-Pack 280.1 Series Pull To Seat (Black)	
Pin	Wire Color	Circuit No	Function
A	PNK	639	Fused Output Ignition 1
B	BLK	950	P/B Booster Vacuum Pump Ground

P/B Brake Booster Vacuum Switch



Connector Part Information		• 12162000 • 2 Way M Metri-Pack 150 Series Sealed (Black)	
Pin	Wire Color	Circuit No	Function
A	BLK	50	Ground
B	BLK/WHT	950	P/B Booster Vacuum Pump Ground

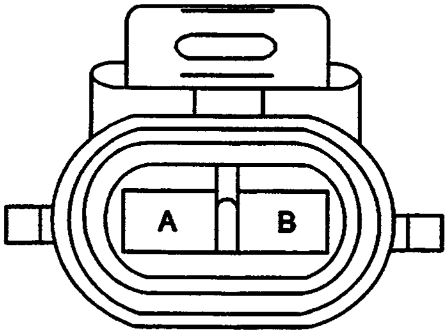
CONNECTOR END VIEWS

Passenger Side Inflatable Restraint Inflator Module

Drawing Not Available

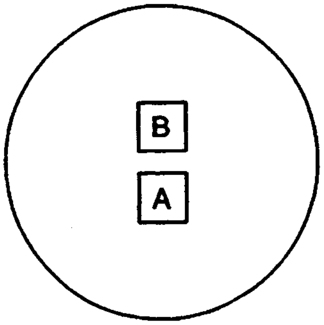
Connector Part Information		• 12186799 • 2 Way M Metri-Pack 280 Series P2S (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	WHT/BLK	1403	SIR Inflator Feed Passenger
B	DK GRN/WHT	1404	SIR Inflator Output Passenger

Secondary Battery Valve



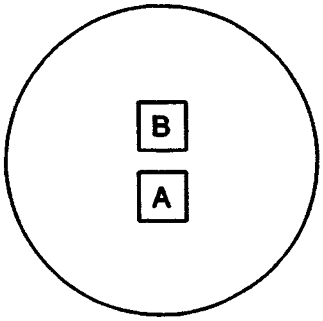
Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series Sealed (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	640	Fused Output Battery
B	LT GRN/BLK	366	Mode Valve Solenoid Output Lower

Side Marker Lamp, LH Front



Connector Part Information		• 12110053 • 2 Way F Asm, Lamp Socket Wedge Base Type W-2 (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2309	Park Lamp Feed
B	LT BLU/BLK	2114/150	Turn Signal Output/Ground

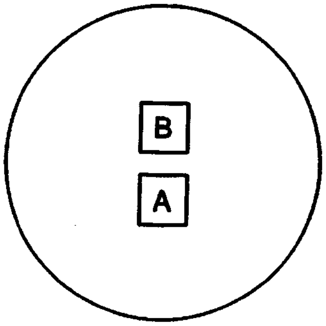
Side Marker Lamp, LH Rear



Connector Part Information		• 12110053 • 2 Way F Lamp Socket Wedge Base (Lt Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2509	Park Lamp Feed
B	BLK	1750	Ground

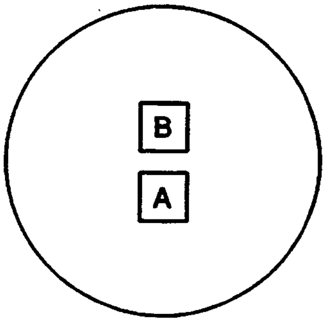
CONNECTOR END VIEWS

Side Marker Lamp, RH Front



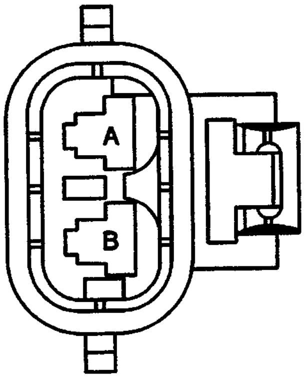
Connector Part Information		• 12110053 • 2 Way F Asm, Lamp Socket Wedge Base Type W-2 (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2309	Park Lamp Feed
B	DK BLU/BLK	2115/250	Turn Signal Output/Ground

Side Marker Lamp, RH Rear



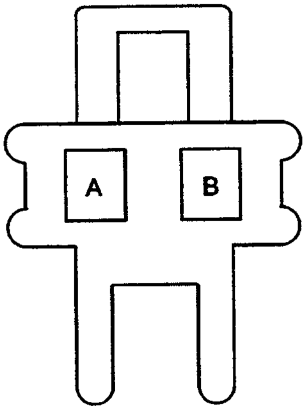
Connector Part Information		• 12110053 • 2 Way F Asm, Lamp Socket Wedge Base Type W-2 (Lt Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	2609	Park Lamp Feed
B	BLK	2250	Ground

Supplemental Inflatable Restraint Discriminating Sensor, RH Front



Connector Part Information		• 12176650 • 2 Way F Metri-Pack 280 Series Sealed (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL	1834	SIR Forward Sensor Signal
B	BLK/WHT	1851	SIR Ground

Supplemental Inflatable Restraint Steering Wheel Inflator Module



Connector Part Information		• 12124635 • 2 Way M Metri-Pack 280 SIR Series (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	WHT	347	SIR Inflator Feed Driver
B	DK GRN	348	SIR Inflator Output Driver

CONNECTOR END VIEWS

Underhood Bussed Electrical Center (UBEC)-C5

Drawing Not Available

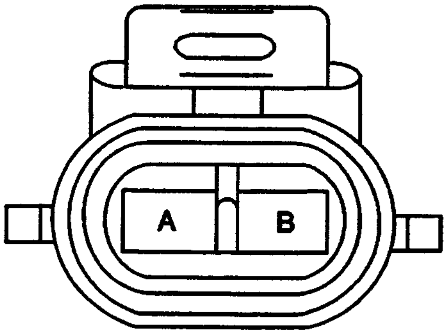
Connector Part Information		• 12146037 • Maxi-Fuse (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	542	Battery Fused
B	RED	342	Battery Fused

Underhood Bussed Electrical Center (UBEC)-C6

Drawing Not Available

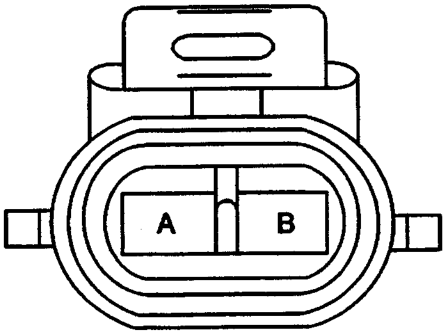
Connector Part Information		• 12146038 • Maxi-Fuse (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	442	Fused Output Battery
B	RED	642	Fused Output Battery

Wheel Speed Sensor, LH Rear



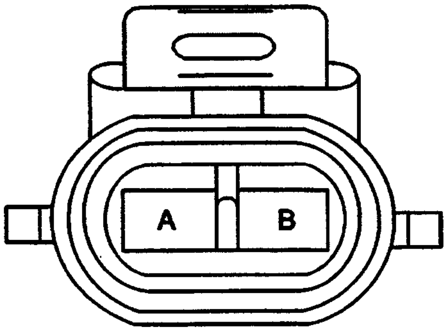
Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series Sealed (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	882	Wheel Speed Sensor Signal Rear
B	WHT	883	Wheel Speed Sensor Return Rear

Wheel Speed Sensor, RH Rear



Connector Part Information		• 12052644 • 2 Way F Metri-Pack 150 Series Sealed (Gray)	
Pin	Wire Color	Circuit No	Function
A	BLK	884	Wheel Speed Sensor Signal Rear
B	RED	885	Wheel Speed Sensor Return Rear

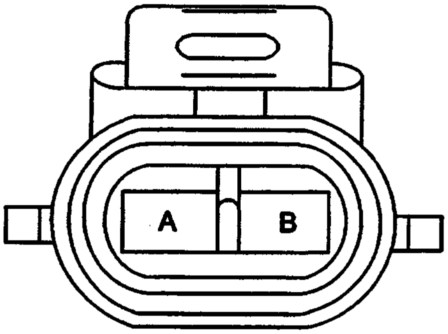
Wheel Speed Sensor, LH Front



Connector Part Information		• 12052641 • 2 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	Wire Color	Circuit No	Function
A	LT BLU	830	Wheel Speed Sensor Signal Front
B	YEL	873	Wheel Speed Sensor Return Front

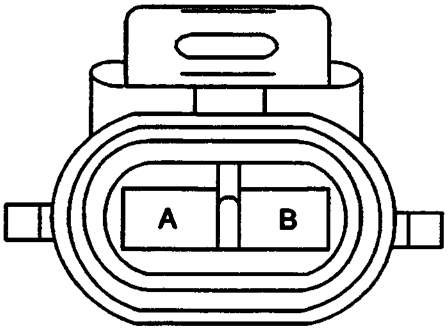
CONNECTOR END VIEWS

Wheel Speed Sensor, RH Front



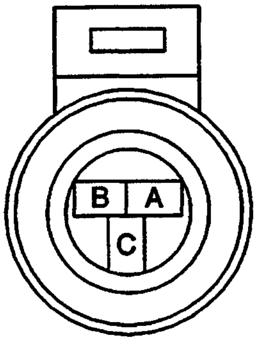
Connector Part Information		• 12052641 • 2 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	TAN	833	Wheel Speed Sensor Return Front
B	DK GRN	872	Wheel Speed Sensor Signal Front

Windshield Washer Pump



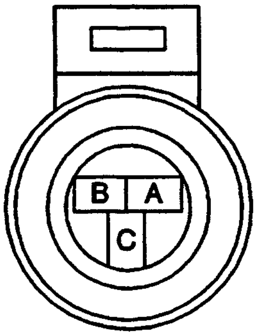
Connector Part Information		• 12052641 • 2 Way F Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	228	Windshield Washer Pump Motor Feed
B	BLK	350	Ground

A/C High Pressure Sensor



Connector Part Information	• 12078090 • 3 Way F Metri-Pack 150 Series Pull To Seat (Black)		
Pin	Wire Color	Circuit No	Function
A	BLK/WHT	451	PCM Ground
B	GRY	605	Reference Voltage Feed 5 Volt Reference
C	RED/BLK	380	Air Conditioning Refrigerant Pressure Sensor Signal

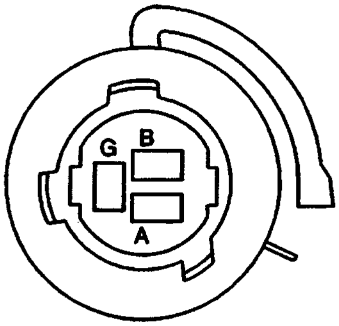
A/C Low Pressure Sensor



Connector Part Information	• 12078090 • 3 Way F Metri-Pack 150 Series Pull To Seat (Black)		
Pin	Wire Color	Circuit No	Function
A	BLK/WHT	451	PCM Ground
B	GRY	605	Reference Voltage Feed 5 Volt Reference
C	YEL	5123	A/C Low Pressure Sensor Signal

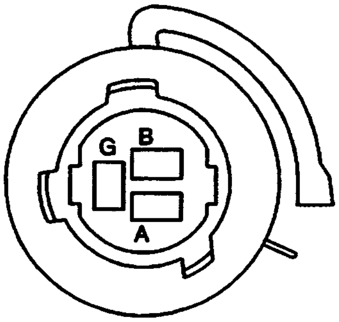
CONNECTOR END VIEWS

Backup Lamp, LH



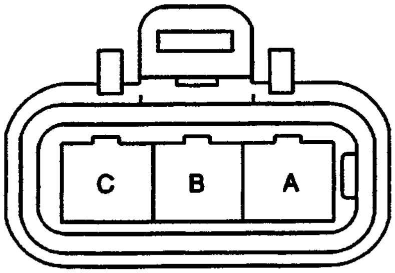
Connector Part Information		• 12092379 • 3 Way F Lamp Socket Wedge Base Type W-3 (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT GRN	1324	Backup Lamp Feed
B	—	—	Blocked
G	BLK	1750	Ground

Backup Lamp, RH



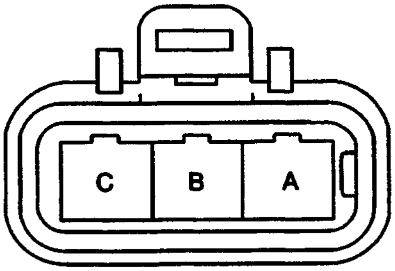
Connector Part Information		• 12092379 • 3 Way F Lamp Socket Wedge Base Type W-3 (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT GRN	1324	Backup Lamp Feed
B	—	—	Blocked
G	BLK	2250	Ground

Battery Pack Blower Assembly



Connector Part Information	• 12092311 • 3 Way F Metri-Pack 480 Pull To Seat (Black)		
Pin	Wire Color	Circuit No	Function
A	BLK	50	Ground
B	PPL	5650	Battery Pack Fan Request
C	ORN	1840	Fused Output Battery

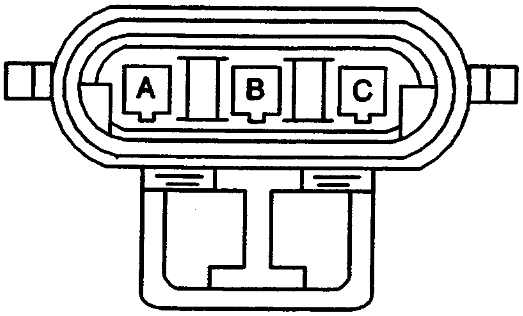
Battery Thermal Module (see Battery Pack Blower Assembly)



Connector Part Information	• 12092311 • 3 Way F Metri-Pack 480 Pull To Seat (Black)		
Pin	Wire Color	Circuit No	Function
A	BLK	50	Ground
B	PPL	5650	Battery Pack Fan Request
C	ORN	1840	Fused Output Battery

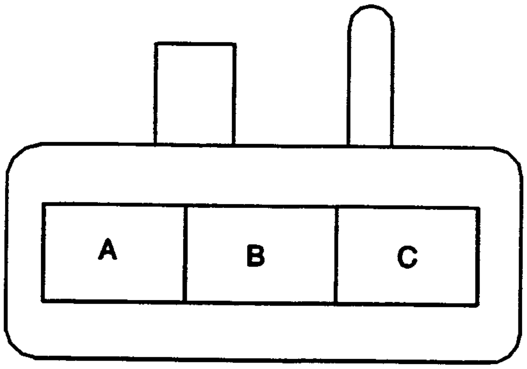
CONNECTOR END VIEWS

Coolant Level Sensor



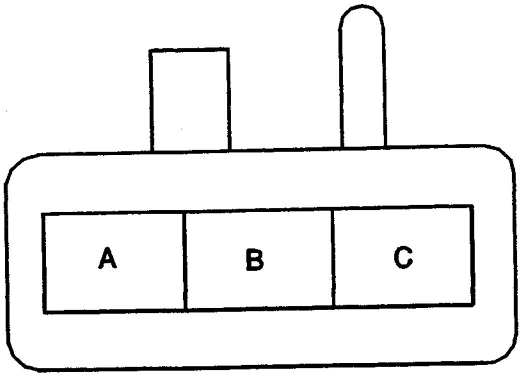
Connector Part Information		• 12110293 • 3 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK/WHT	451	PCM Ground
B	ORN	5620	Accessory Power Module Output Command
C	LT GRN	1478	Low Coolant Sensor Signal

Door Jamb Switch, LH



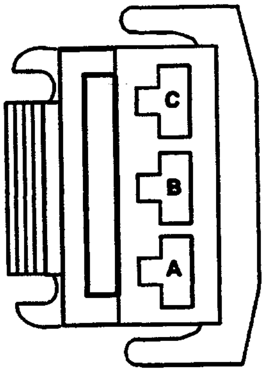
Connector Part Information		• 12047781 • 3 Way F Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	TAN	126	Drive Door Jamb
B	BLK	1050	Ground
C	—	—	Not Used

Door Jamb Switch, RH



Connector Part Information	• 12047781 • 3 Way F Metri-Pack 150 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	54	Door Handle Switch
B	BLK	1050	Ground
C	—	—	Not Used

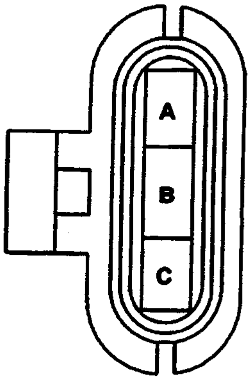
HVAC Control C1



Connector Part Information	• 12162512 • 3 Way F Metri-Pack 480 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	203	Air Conditioning Switch Output
B	BRN	64	High Speed Blower Relay Feed Coil
C	BRN	141	Fused Output Ignition 3

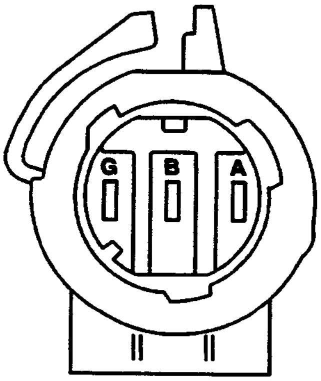
CONNECTOR END VIEWS

HVAC Control C2



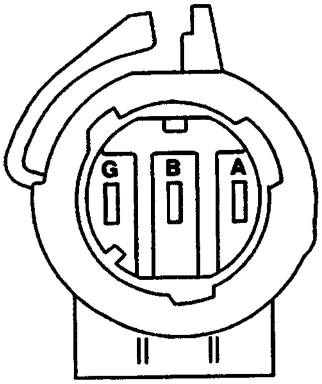
Connector Part Information		• 12034146 • 3 Way F Metri-Pack 280 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK/WHT	606	HVAC Control Temperature Signal
B	LT BLU	733	Air Temperature Valve Position Sensor Signal
C	GRY	605	Reference Voltage Feed 5 Volt Reference

Park/Turn Signal Lamp, LH Front



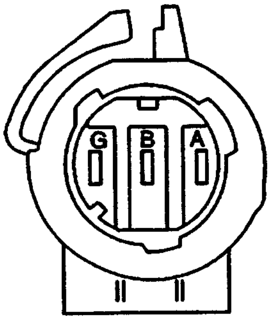
Connector Part Information		• 12160394 • 3 Way F Lamp Socket Wedge Base (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	2114	Turn Signal Lamp Feed Front
B	BRN	2309	Park Lamp Feed
G	BLK	150	Ground

Park/Turn Signal Lamp, RH Front



Connector Part Information		• 12160394 • 3 Way F Lamp Socket Wedge Base (Natural)	
Pin	Wire Color	Circuit No	Function
A	DK BLU	2115	Turn Signal Lamp Feed Front
B	BRN	2309	Park Lamp Feed
G	BLK	250	Ground

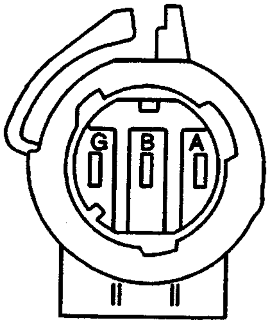
Tail/Stop/Turn Signal Lamp, LH Rear



Connector Part Information		• 12160395 • 3 Way F Lamp Socket Wedge Base Type W-3 Right Angle (Med. Gray)	
Pin	Wire Color	Circuit No	Function
A	YEL	618	Stop, Turn Lamp Feed Rear
B	BRN	2509	Park Lamp Feed
G	BLK	1750	Ground

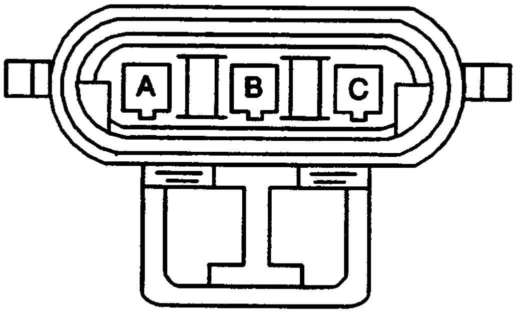
CONNECTOR END VIEWS

Tail/Stop/Turn Signal Lamp, RH Rear



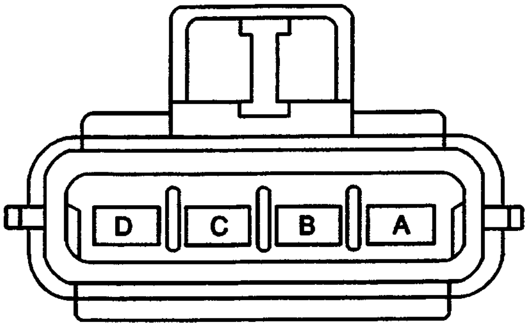
Connector Part Information		• 12160395 • 3 Way F Lamp Socket Wedge Base Type W-3 Right Angle (Med. Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN	619	Stop, Turn Lamp Feed Rear
B	BRN	2609	Park Lamp Feed
G	BLK	2250	Ground

Transmission Range Indicator Switch C2



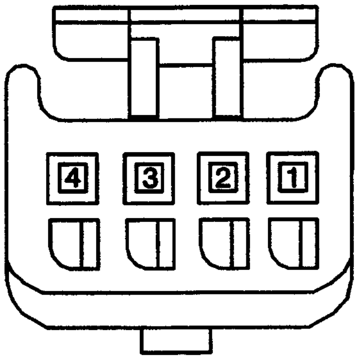
Connector Part Information		• 12110293 • 3 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	840	Fused Output Battery
B	GRY	1524	Backup Lamp Feed
C	LT GRN/BLK	275	Park Select

A/C Condenser Cooling Fan Buffer



Connector Part Information		• 12129565 • 4 Way F Metri-Pack 280 Series Sealed (Gray)	
Pin	Wire Color	Circuit No	Function
A	ORN	1640	Fused Output Battery
B	DK GRN	335	High Speed Blower Relay Feed Coil
C	ORN	5620	Blower Resistor Output
D	BLK	250	Ground

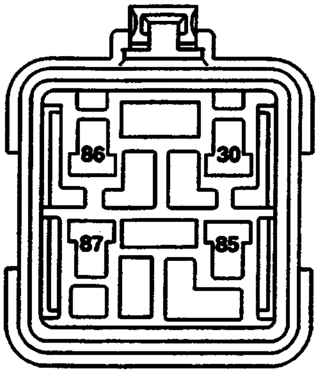
Auxiliary Heater (FFH) Switch



Connector Part Information		• 12059162 • 4 Way F Micro-Pack 100 Series (Blue)	
Pin	Wire Color	Circuit No	Function
A	GRY	1220	Dimming Pot
B	BRN	64	High Speed Blower Relay Feed Coil
C	GRY	910	Blower Resistor Output
D	BLK	1050	Ground

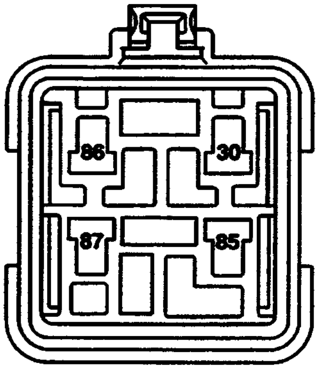
CONNECTOR END VIEWS

Battery Valve Primary Relay



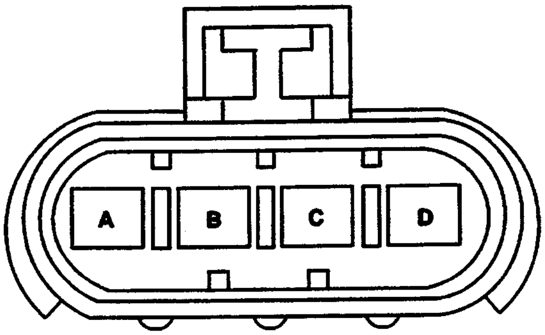
Connector Part Information		• 12129716 • 4 Way F Metri-Pack 280 Series Flexlock (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
30	TAN	363	Mode Valve Solenoid Output Upper
85	ORN	640	Fused Output Battery
86	BLK	2901	Blower Resistor Output
87	BLK	250	Ground

Battery Valve Secondary Relay



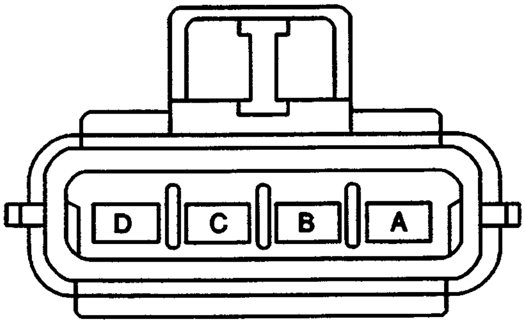
Connector Part Information		• 12129716 • 4 Way F Metri-Pack 280 Series Flexlock (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
30	LT GRN/BLK	366	Mode Valve Solenoid Output Lower
85	ORN	640	Fused Output Battery
86	PPL	1397	A/C Switch Signal Heat Solenoid Control
87	BLK	250	Ground

Blower Motor Resistor



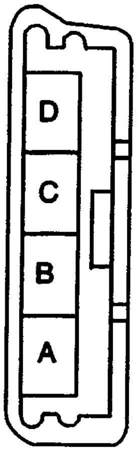
Connector Part Information		• 12048412 • 4 Way F Metri-Pack 480 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	72	Blower Switch Output Medium 2
B	BRN	64	High Speed Blower Relay Feed Coil
C	DK BLU	101	Blower Resistor Output
D	TAN	63	Blower Switch Output Medium 1

Coolant Pump Buffer



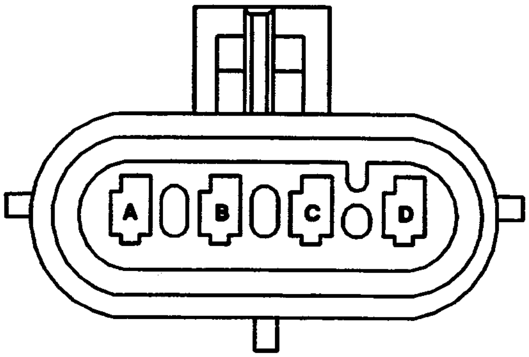
Connector Part Information		• 12129565 • 4 Way F Metri-Pack 280 Series Sealed (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	840	Fused Output Battery
B	PNK	2014	Coolant Pump Relay Output Coil
C	ORN	5620	Accessory Power Module Output Command
D	BLK	250	Ground

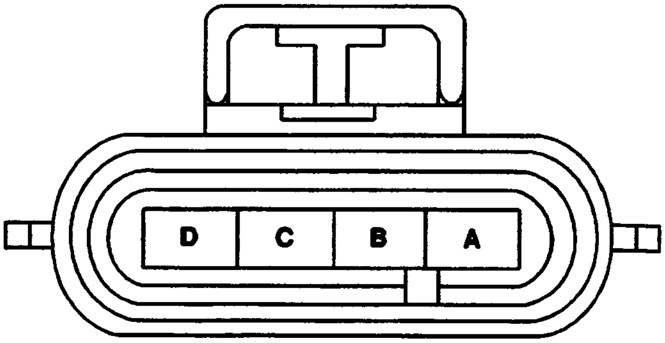
Dome Lamp and High Mounted Stop Lamp



Connector Part Information		• 12103329 • 4 Way F Conn, Asm, Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	1320	Fused Output CHMSL
B	BLK	1850	TBC Ground
C	ORN	40	Fused Output Battery
D	WHT	156	Courtesy Lamp Output

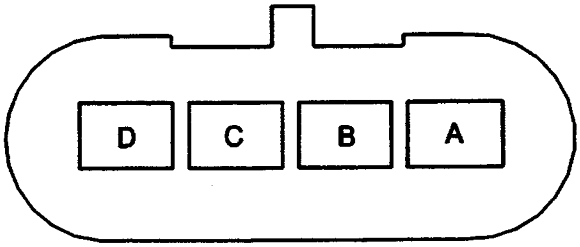
High Voltage Disconnect Loop Wire Assembly, and Connector





Connector Part Information		• 12162144 • 4 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	960	High Voltage Disconnect Out
B	BLK	50	Ground
C	RED/WHT	951	High Voltage Disconnect In
D	BLK/WHT	931	High Voltage Disconnect Relay

High Voltage Disconnect



Connector Part Information		• 12162102 • 4 Way M Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	RED	960	High Voltage Disconnect Out
B	BLK	50	Ground
C	RED/WHT	951	High Voltage Disconnect In
D	BLK/WHT	931	High Voltage Disconnect

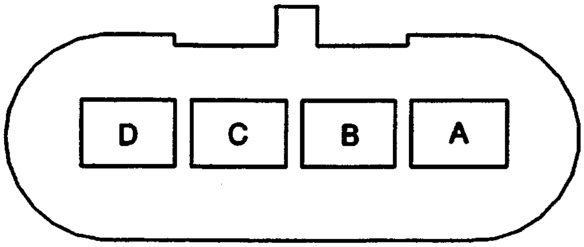
Horn Relay

Drawing Not Available

Connector Part Information		• • 4 Way M Relay SPDT 280 Micro (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
30	WHT	17	Stop Lamp Switch Output
85	WHT	17	Stop Lamp Switch Output
86	BLK	50	Ground
87	LT BLU	20	Stoplamp Feed

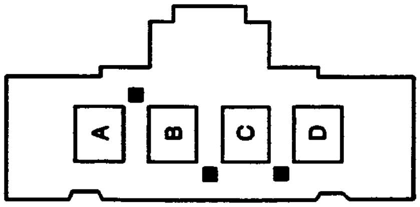
CONNECTOR END VIEWS

Refrigerant Reversing Valve



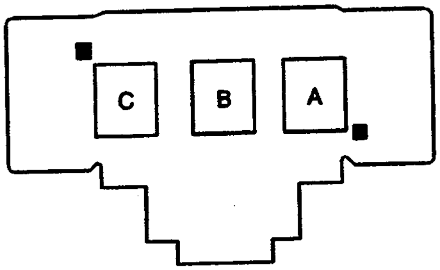
Connector Part Information		• 12124583 • 4 Way M Metri-Pack 150 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	250	Ground
B	WHT	2016	Refrigerant Reversing Valve Control Signal
C	TAN	363	Mode Valve Solenoid Output Upper
D	ORN	640	Fused Output Battery

Supplemental Inflatable Restraint Arming Sensor, Rear



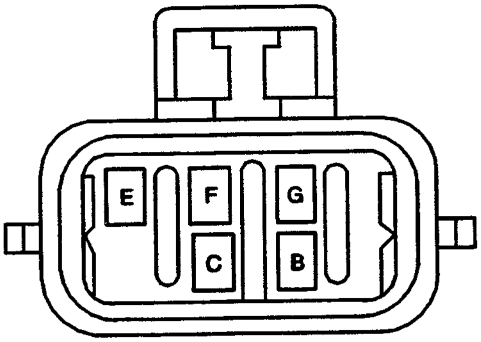
Connector Part Information		• 12146081 • 4 Way F Metri-Pack 280 Series (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL	1139	Fused Output Ignition 1
B	YEL/BLK	236	SIR Dual Arming Sensor Feed Driver 36 Volt
C	LT GRN	1400	SIR Dual Arming Sensor Signal Driver
D	WHT	347	SIR Inflator Feed Driver

Supplemental Inflatable Restraint Discriminating Sensor, LH



Connector Part Information		• 12191660 • 3 Way F Connector (Yellow)	
Pin	Wire Color	Circuit No	Function
A	YEL	1834	SIR Forward Sensor Signal
B	YEL	1834	SIR Forward Sensor Signal
C	BLK/WHT	1851	SIR Ground
D	BLK/WHT	1851	SIR Ground

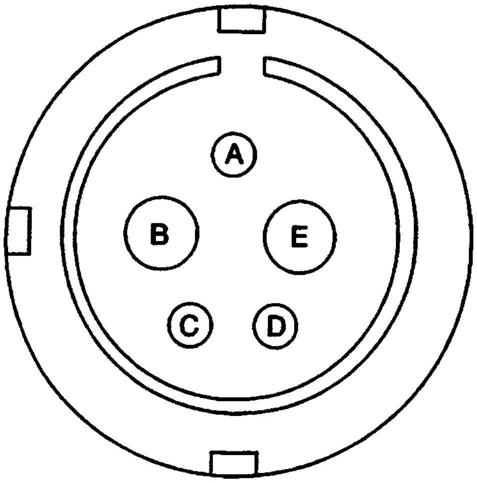
Auxiliary (FFH) Heater



Connector Part Information		• 12052600 • 5 Way F Conn Asm, Metri-Pack 150 Series, Sealed (Gray)	
Pin	Wire Color	Circuit No	Function
B	GRY/BLK	924	Fuel Fired Heater Fault Input
C	DK BLU	925	Fuel Fired Heater Relay 12 Volt Output
E	BLK	50	Ground
F	ORN/BLK	840	Fused Output Battery
G	GRY	120	Fuel Pump Motor Feed

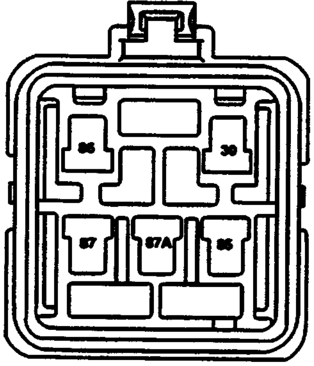
CONNECTOR END VIEWS

Battery Pack High Voltage Cable



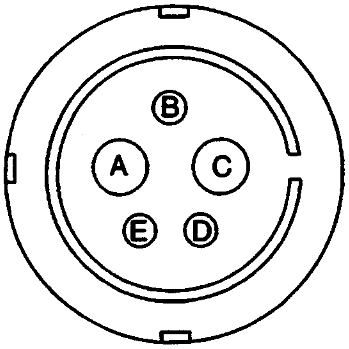
Connector Part Information		• N/A • 5-Way F Cannon Connector (Chrome)	
Pin	Wire Color	Circuit No	Function
A	—	—	Not Used
B	ORN	908	High Voltage Return (HV)
C	PPL	918	HV Interlock Return (-)
D	LT GRN	919	HV Interlock (+)
E	ORN	921	High Voltage (HV +)

Blower Motor Relay



Connector Part Information		• 12110539 • 5 Way F Metri-Pack 280 Series Flexlock (Black)	
Pin	Wire Color	Circuit No	Function
30	PPL	65	Blower Motor Feed
85	BLK	850	Ground
86	ORN	52	Blower Switch Output High
87	ORN	540	Fused Output Battery
87A	DK BLU	101	Blower Resistor Output

Charge Receptacle High Voltage Cable



Connector Part Information		• N/A • 5-Way F Cannon Connector (Chrome)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	—	—	HV (+)
B	—	—	Not Used
C	—	—	HV (-)
D	—	—	HV Interlock Return (-)
E	—	—	HV Interlock (+)

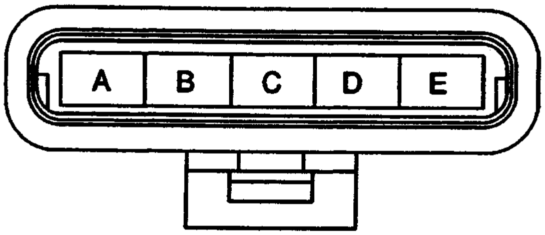
Daytime Running Lamps (DRL) Relay

Drawing Not Available

Connector Part Information		• 12077866 • Relay SPDT 280 Micro (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	—	—	HV (+)
B	—	—	Not Used
C	—	—	HV (-)
D	—	—	HV Interlock Return (-)
E	—	—	HV Interlock (+)

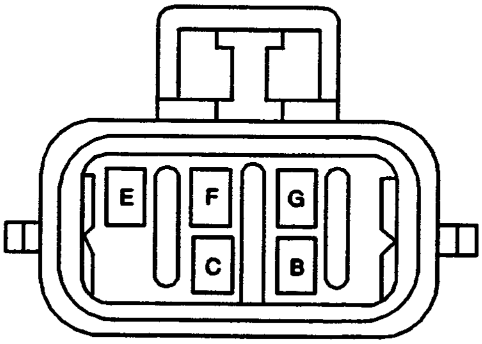
CONNECTOR END VIEWS

Drive Motor Speed and Direction Sensor



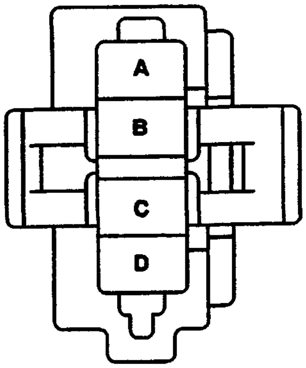
Connector Part Information		• 12162827 • 5 Way F Conn Asm, Metri-Pack 150.2 Series Pull To Seat (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK	552	Signal C Return
B	YEL/BLK	1558	Signal B
C	BARE	514	Shield
D	DK BLU/WHT	1557	Signal A
E	RED	1673	Power

Electronic Brake Control Module (EBCM) C1



Connector Part Information		• 12124662 • 5 Way F Conn Asm, Metri-Pack 150 Series (Brown)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	830	Wheel Speed Sensor Signal Front
B	—	—	Blocked
C	DK GRN	872	Wheel Speed Sensor Signal Front
D	YEL	873	Wheel Speed Sensor Return Front
E	TAN	833	Wheel Speed Sensor Return Front

HVAC Control C3



Connector Part Information		• 12020813 • 5 Way F Conn Asm, Metri-Pack 630 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	52	Blower Switch Output High
B	LT BLU	72	Blower Switch Output Medium 2
C	TAN	63	Blower Switch Output Medium 1
D	—	—	Not Used
E	BRN	64	High Speed Blower Relay Feed Coil

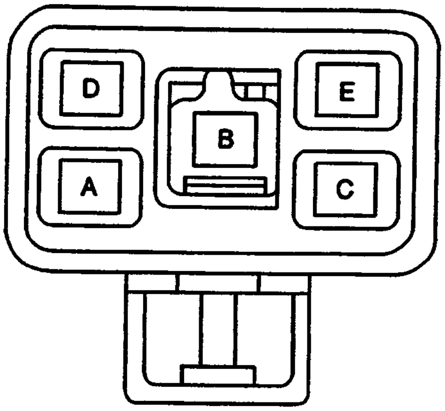
Run 2 Relay

Drawing Not Available

Connector Part Information		• 12077866 • 5 Way F Relay SPDT 280 Micro (Gray or Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	PNK	94	Windshield Washer Switch Signal
B	BLK	150	Ground
C	YEL	143	Fused Output Accessory
D	PPL	92	Windshield Wiper Motor Feed High Speed
E	BRN	96	Windshield Wiper Switch Signal Pulse Delay

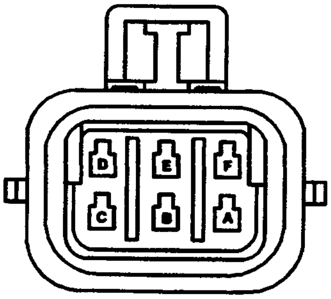
CONNECTOR END VIEWS

Windshield Wiper Motor



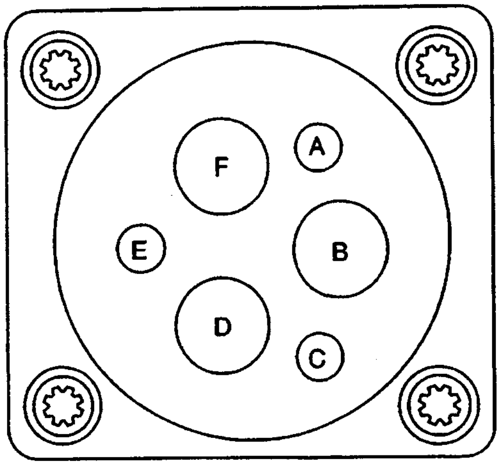
Connector Part Information		• 12124634 • 5 Way F Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	DK GRN	113	Windshield Washer Switch Signal
B	BLK	850	Ground
C	YEL	143	Fused Output Accessory
D	PPL	92	Windshield Wiper Motor Feed High Speed
E	GRY	112	Windshield Wiper Switch Signal Pulse Delay

Charge Receptacle Coolant Valve



Connector Part Information		• 12052848 • 6 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	5620	Accessory Power Module Output Command
B	TAN	5648	Charge Receptacle Coolant Valve Control
C	BLK	1704	Sensor Return
D	GRY	605	Reference Voltage Feed 5 Volt Reference
E	PPL	5649	Charge Receptacle Coolant Valve Feedback
F	—	—	Blocked

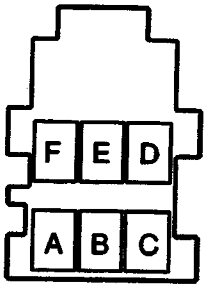
Drive Motor High Voltage Cable



Connector Part Information	• N/A • 6-Way F Cannon Connector (Chrome)		
Pin	**Wire Color**	**Circuit No**	**Function**
A	—	—	High Voltage Interlock
B	—	—	Phase A
C	—	—	High Voltage Interlock Return
D	—	—	Phase B
E	—	—	Not Used
F	—	—	Phase C

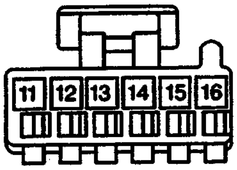
CONNECTOR END VIEWS

IP Module Switch



Connector Part Information		• 15305286 • 6 Way F Metri-Pack 150 Series (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	TAN/BLK	371	IP Module Switch Signal Passenger
B	YEL	1139	Fused Output Ignition 1
C	—	—	Not Used
D	—	—	Not Used
E	PNK	353	IP Module Indicator Lamp Output Passenger
F	—	—	Not Used

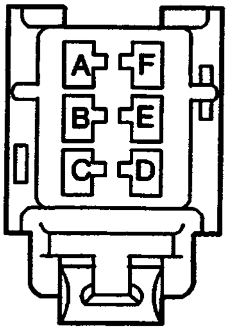
Outside Air Valve Actuator Motor

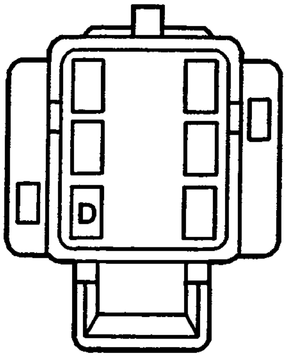


Connector Part Information		• 12040953 • 6 Way F Micro-Pack 100 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
5 (11)	ORN	5620	Accessory Power Module Output Command
6 (12)	DK GRN	1614	Air Inlet Valve Motor Feed
7 (13)	BLK	452	Sensor Return
8 (14)	—	—	Not Used
9 (15)	RED	708	Mode Valve Position Sensor Signal Upper
10 (16)	GRY	605	Reference Voltage Feed 5 Volt Reference

CONNECTOR END VIEWS

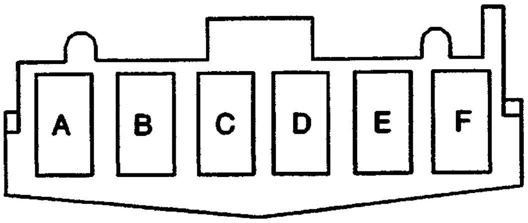
Safety Belt Switch





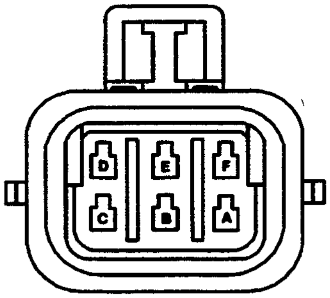
Connector Part Information		• 12064752 • 6 Way F Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used
B	BLK	1850	TBC Ground
C	—	—	Not Used
D	—	—	Not Used
E	BLK/WHT	238	Seat Belt Switch
F	—	—	Not Used

Stoplamps Switch



Connector Part Information		• 12040551 • 6 Way F Metri-Pack 480 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	WHT	17	Stop Lamp Switch Output
B	ORN	1540	Fused Output Battery
C	PPL	420	Brake Switch
D	BRN	441	Fused Output Ignition 3
E	—	—	Not Used
F	—	—	Not Used

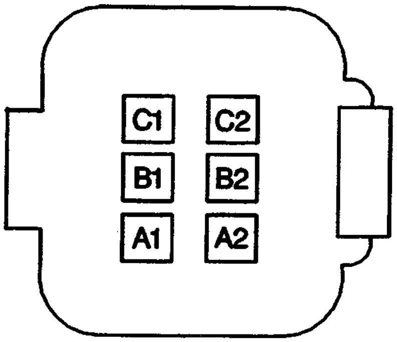
Transmission Range Indicator Switch C1



Connector Part Information		• 12052848 • 6 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BLK/WHT	771	PRND A
B	YEL	772	PRND B
C	GRY	773	PRND C
D	WHT	776	PRND Parity
E	BLK	470	PRND Return
F	—	—	Blocked

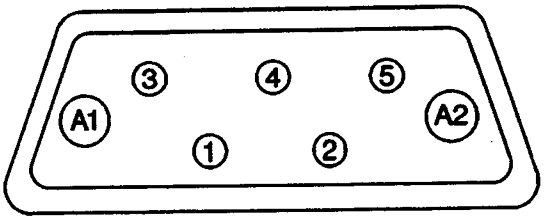
CONNECTOR END VIEWS

Turn Signal/Hazard Flasher



Connector Part Information		• 12110541 • 8 Way F Metri-Pack 280 Series Flexloc (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	LT BLU/GRY	1508/1696	Turn/Hazard Module Feed
A2	—	—	Not Used
B1	—	—	Not Used
B2	BLK	1050	Ground
C1	PPL	1697	Turn/Hazard Module Output
C2	—	—	Not Used

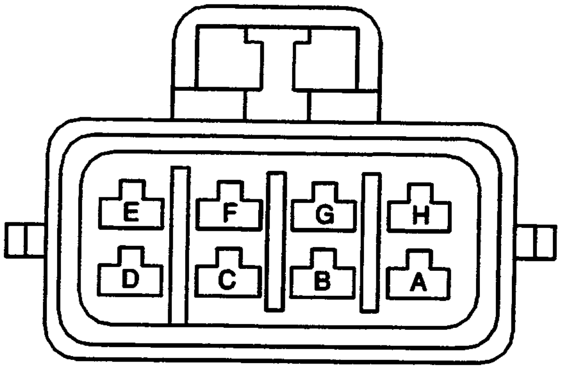
Accessory Power Control Module (APM) Blindmate Connector



Connector Part Information	• **N/A** • **7 Way F Blindmate (N/A)**		
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	HV Batt (+)
1	—	—	HV Interlock Return (-)
2	—	—	Not Used
3	—	—	Not Used
4	—	—	Not Used
5	—	—	HV Interlock (+)
A2	—	—	HV Batt (-)

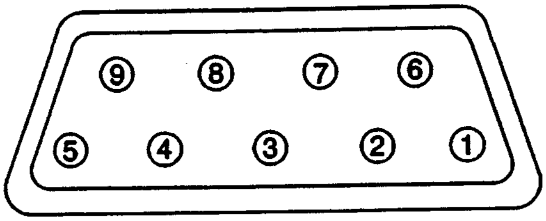
CONNECTOR END VIEWS

Charge Receptacle



Connector Part Information		• 12047937 • 8 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	ORN	1040	12 V Regulated
B	DK GRN	2023	Charge Receptacle Paddle Present
C	PPL	1807	Class 2 BUS
D	WHT/BLK	5646	Charge Receptacle Temp 5V Ref
E	BLK	250	Ground
F	—	—	Blocked
G	WHT	2027	Vehicle Wake Up
H	DK BLU	660	Charge Receptacle Temp Return

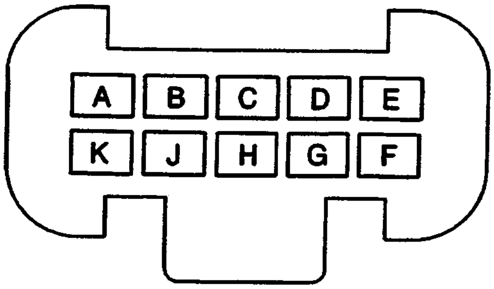
Power Steering Control Module (PSCM) Blindmate Connector



Connector Part Information	• **N/A** • **9 Way F Blindmate (N/A)**		
Pin	**Wire Color**	**Circuit No**	**Function**
1	—	—	Power Steering Pump Speed Input
2	—	—	Run 2
3	—	—	Not Used
4	—	—	PSCM HV Interlock (+)
5	—	—	HV (-)
6	—	—	Ground
7	—	—	Not Used
8	—	—	HV (+)
9	—	—	PSCM HV Interlock Return (-)

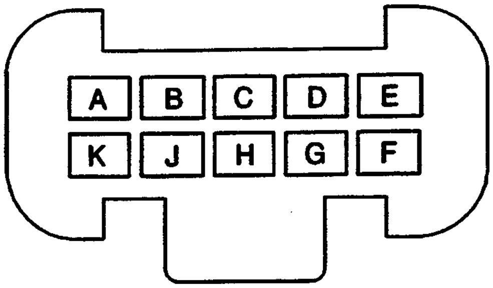
CONNECTOR END VIEWS

Accelerator Pedal Position Sensor (APP)



Connector Part Information		• 12065425 • 10 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	WHT	963	APP1 Sensor Ground
B	BLK	964	APP2 Sensor Ground
C	PNK	965	APP2 Signal
D	PPL	966	APP2 5 Volt Reference
E	DK GRN	969	APP3 5 Volt Reference
F	TAN	962	APP1 Signal
G	YEL	961	APP1 5 Volt Reference
H	—	—	Not Used
J	RED	967	APP3 Sensor Ground
K	LT GRN	968	APP3 Signal

Electronic Brake Control Module (EBCM) C2



Connector Part Information		• 12177081 • 10 Way F GT 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	BRN	441	Fused Output Ignition 3
B	—	—	Not Used
C	PPL	420	Brake Switch
D	—	—	Not Used
E	YEL/BLK	1827	Vehicle Speed Signal 128000 Pulses Per Mile
F	—	—	Not Used
G	LT BLU	1122	Serial Data Signal Class B 10400 Baud Primary
H	PPL	680	ABS Pressure Differential Sensor Signal
J	BLK/WHT	451	PCM Ground
K	—	—	Not Used

CONNECTOR END VIEWS

Headlamp Switch

Drawing Not Available

Connector Part Information		• **15304617** • **10 Way F GT 150,280 Series (Black)**	
Pin	**Wire Color**	**Circuit No**	**Function**
A	LT BLU	74	Park Lamp Switch Output
B	ORN	240	Fused Output Battery
C	WHT	352	Headlamp Relay
D	ORN	1940	Fused Output Battery
E	BLK	1050	Ground
F	—	—	Not Used
G	DK BLU/WHT	1495	Dome Lamp
H	PPL/WHT	549	Headlamp Request
J	PPL	328	Dome Override
K	DK GRN	44	Instrument Panel Lamps Dimmer Output

HVAC Control Illumination Lamp

Drawing Not Available

Connector Part Information		• 12191271 • 10 Way F P/C Bow P2S (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	GRY	1220	Dimming Pot
2	—	—	Not Used
3	—	—	Not Used
4	—	—	Not Used
5	BLK	1050	Ground
6	—	—	Not Used
7	—	—	Not Used
8	—	—	Not Used
9	—	—	Not Used
10	—	—	Not Used

CONNECTOR END VIEWS

Radio C1

Drawing Not Available

Connector Part Information	• 12047531 • 10 Way F Micro-Pack 100 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**
1	GRY	118	Speaker Return Front
2	TAN	201	Speaker Feed Front
3	DK GRN	117	Speaker Return Front
4	LT GRN	200	Speaker Feed Front
5	BLK	1050	Ground
6	PPL/WHT	1382	Dimming Disable
7	GRY	1220	Dimming Pot
8	—	—	Not Used
9	DK GRN	1301	Fused Output Retained Accessory Power
10	ORN	340	Fused Output Battery

Radio C2

Drawing Not Available

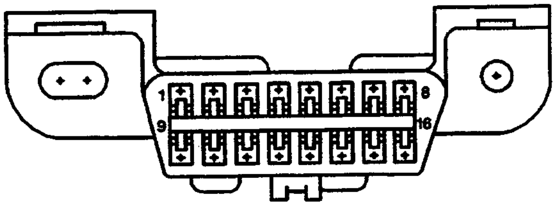
Connector Part Information		• 12065785 • 10 Way F Micro-Pack 100 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	—	—	Not Used
2	—	—	Not Used
3	—	—	Not Used
4	—	—	Not Used
5	—	—	Not Used
6	DK GRN	389	Vehicle Speed Signal
7	LT BLU	115	Speaker Return Rear
8	DK BLU	46	Speaker Feed Rear
9	YEL	116	Speaker Return Rear
10	BRN	199	Speaker Feed Rear

Supplemental Inflatable Restraint Diagnostic Energy Reserve Module (DERM)

Drawing Not Available

Connector Part Information		• 15317747 • 12 Way F Micro-Pack 100 Series (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	WHT/BLK	1403	SIR Inflator Feed Passenger
2	WHT	347	SIR Inflator Feed Driver
3	DK GRN	348	SIR Inflator Output Driver
4	DK GRN/WHT	1404	SIR Inflator Output Passenger
5	TAN	800	Serial Data Link 1
6	BLK/WHT	1851	SIR Ground
7	BRN	358	SIR Indicator Lamp
8	BLK/WHT	238	Seat Belt Switch
9	YEL	1834	SIR Forward Sensor Signal
10	YEL	1139	Fused Output Ignition 1
11	TAN/BLK	371	IP Module Switch Signal Passenger
12	PNK	353	IP Module Indicator Lamp Output Passenger

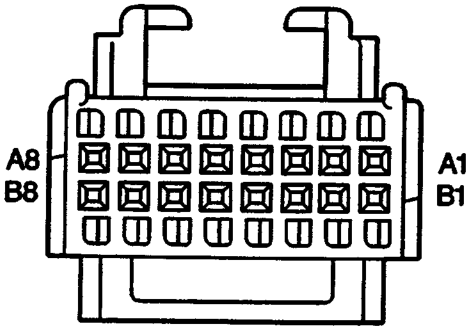
Data Link Connector (DLC)



Connector Part Information		• **12110250** • **16 Way F Metri-Pack 150 Series (Black)**	
Pin	**Wire Color**	**Circuit No**	**Function**
1	—	—	Not Used
2	PPL	1132	Serial Data Signal Class B 10400 Baud ALDL
3	—	—	Not Used
4	BLK	1850	TBC Ground
5	BLK/WHT	451	PCM Ground
6	—	—	Not Used
7	—	—	Not Used
8	—	—	Not Used
9	TAN	800	Serial Data Link 1
10	—	—	Not Used
11	—	—	Not Used
12	—	—	Not Used
13	—	—	Not Used
14	—	—	Not Used
15	—	—	Not Used
16	ORN	640	Fused Output Battery

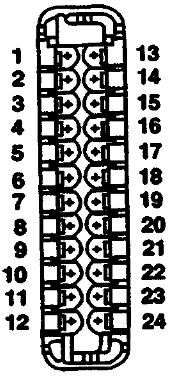
CONNECTOR END VIEWS

Truck Body Control Module (TBC) - C3



Connector Part Information		• 12191375 • 16 Way F Metri-Pack 100 Series (Purple)	
Pin	Wire Color	Circuit No	Function
A1	—	—	Not Used
A2	DK BLU/WHT	1495	Dome Lamp
A3	—	—	Not Used
A4	GRY	705	Ambient Light Sensor
A5	GRY	1220	Dimming Pot
A6	WHT	278	Photocell Signal
A7	—	—	Not Used
A8	—	—	Not Used
B1	—	—	Not Used
B2	ORN	54	Door Handle Switch
B3	—	—	Not Used
B4	TAN	126	Drive Door Jamb
B5	—	—	Not Used
B6	PPL	328	Dome Override
B7	—	—	Not Used
B8	PPL/WHT	549	Headlamp Request

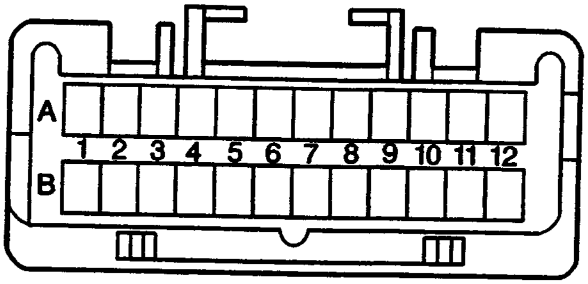
Accessory Power Control Module (APM)



Connector Part Information		• 12129225 • 24 Way F Micro-Pack 100 Series (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	BRN	241	Fused Output Ignition 3
2	ORN	5620	Fused Output Ignition 1
3	—	—	Not Used
4	BLK/WHT	4906	Compressor Motor Control Speed Command
5	—	—	Not Used
6	—	—	Not Used
7	—	—	Not Used
8	PNK/BLK	4905	Compressor Motor Control DC Current
9	—	—	Not Used
10	—	—	Not Used
11	—	—	Not Used
12	—	—	Not Used
13	—	—	Not Used
14	—	—	Not Used
15	—	—	Not Used
16	—	—	Not Used
17	—	—	Not Used
18	DK BLU	5643	Compressor Motor Control Status 0
19	YEL	5644	Compressor Motor Control Status 1
20	PPL	5645	Compressor Motor Control Status 2
21	—	—	Not Used
22	—	—	Not Used
23	—	—	Not Used
24	WHT	2027	Vehicle Wake Up

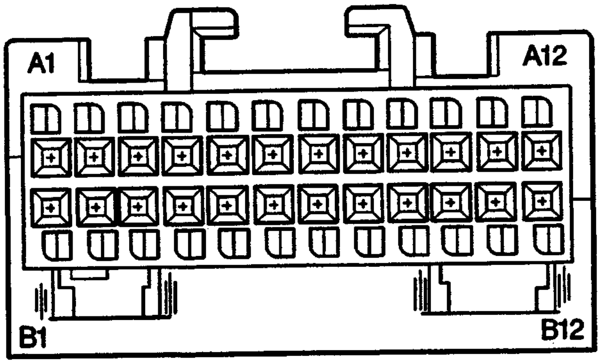
CONNECTOR END VIEWS

Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM) - C1



Connector Part Information		• 12047946 • 24 Way F Micro-Pack 100 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	LT BLU	733	Air Temperature Valve Position Sensor Signal
A2	BRN	718	Sensor Return
A3	PPL	719	Sensor Return
A4	—	—	Not Used
A5	PPL	5649	—
A6	RED/BLK	380	Air Conditioning Refrigerant Pressure Sensor Signal
A7	LT GRN BLK	735	Outside Ambient Temperature Sensor Signal
A8	—	—	Not Used
A9	—	—	Not Used
A10	YEL	5123	—
A11	RED	708	Mode Valve Position Sensor Signal Upper
A12	YEL	410	Coolant Temperature Sensor Signal
B1	GRY	605	Reference Voltage Feed 5 Volt Reference
B2	ORN	1740	Fused Output Battery
B3	—	—	Not Used
B4	—	—	Not Used
B5	—	—	Not Used
B6	PNK	1020	Run 1
B7	—	—	Not Used
B8	LT GRN	1478	Low Coolant Sensor Signal
B9	BLK	1704	Sensor Return
B10	TAN	5648	—
B11	—	—	Not Used
B12	—	—	Not Used

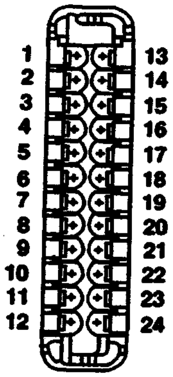
Instrument Cluster



Connector Part Information	• 12110088 • 24 Way F Micro-Pack 100 Series (Gray)		
Pin	**Wire Color**	**Circuit No**	**Function**
A1	YEL	172	Low Fuel Indicator Lamp Output
A2	—	—	Not Used
A3	PPL	922	—
A4	DK GRN	389	Vehicle Speed Signal
A5	—	—	Not Used
A6	GRY	1036	Class 2
A7	PNK	39	IGN 1
A8	PNK	1020	Run 1
A9	BLK/WHT	451	PCM Ground
A10	ORN	340	Fused Output Battery
A11	TAN	1855	Service Soon Tell Tale
A12	ORN/BLK	1786	Transmission Park/Neutral Signal
B1	LT BLU/BLK	1414	LF Turn Signal
B2	GRY	1220	Dimming Pot
B3	BLK	1050	Ground
B4	—	—	Not Used
B5	—	—	Not Used
B6	—	—	Not Used
B7	—	—	Not Used
B8	—	—	Not Used
B9	—	—	Not Used
B10	WHT/BLK	2029	Wait Indicator Lamp
B11	DK BLU/WHT	1415	RF Turn Signal
B12	BRN	358	SIR Indicator Lamp

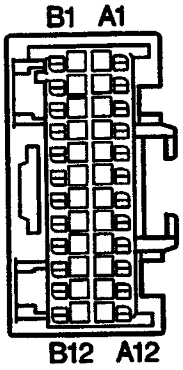
CONNECTOR END VIEWS

Power Inverter Module C2



Connector Part Information		• 12129225 • 24 Way F Micro-Pack 100 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	—	—	Not Used
2	—	—	Not Used
3	—	—	Not Used
4	PNK	1798	Motor Winding Temperature Sensor Return
5	DK GRN	37	Motor Winding Temperature
6	BLK	470	PRND Return
7	WHT	776	PRND Parity
8	GRY	773	PRND C
9	YEL	772	PRND B
10	BLK/WHT	771	PRND A
11	—	—	Not Used
12	—	—	Not Used
13	RED	1673	Power
14	DK BLU/WHT	1557	Signal A
15	YEL/BLK	1558	Signal B
16	BLK	552	Signal C Return
17	BARE	514	Shield
18	—	—	Not Used
19	—	—	Not Used
20	—	—	Not Used
21	—	—	Not Used
22	—	—	Not Used
23	—	—	Not Used
24	—	—	Not Used

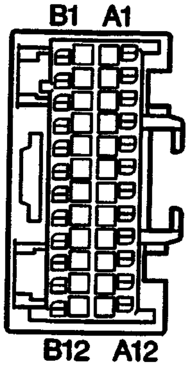
Truck Body Control Module (TBC) - C1



Connector Part Information	• 12160778 • 24 Way F Micro-Pack 100 Series (Brown)		
Pin	**Wire Color**	**Circuit No**	**Function**
A1	BLK	1850	TBC Ground
A2	ORN	1140	Batt Pwr
A3	—	—	Not Used
A4	—	—	Not Used
A5	—	—	Not Used
A6	—	—	Not Used
A7	BLK	755	RAP Relay
A8	DK BLU	1393	Inadvertent Power
A9	BLK	28	Horn Relay
A10	—	—	Not Used
A11	LT GRN/BLK	592	DRL Relay
A12	LT GRN	1037	Class 2
B1	BLK	1850	TBC Ground
B2	PNK	39	IGN 1
B3	RED/WHT	812	12V Ref
B4	—	—	Not Used
B5	GRY	705	Ambient Light Sensor
B6	LT BLU/WHT	1414	LF Turn Signal
B7	LT BLU/WHT	1415	RF Turn Signal
B8	—	—	Not Used
B9	BRN	41	IGN 3
B10	LT BLU	1134	Park Brake Switch
B11	BLK/WHT	238	Seat Belt Switch
B12	—	—	Not Used

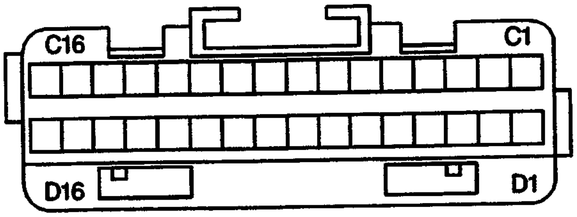
CONNECTOR END VIEWS

Truck Body Control Module (TBC) - C2



Connector Part Information		• 12110206 • 24 Way F Micro-Pack 100 Series (Blue)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	YEL	710	Class 2
A2	ORN/BLK	1057	Analog Return
A3	GRY/BLK	690	Courtesy Lamp Relay
A4	—	—	Not Used
A5	WHT	1080	Park Lamp Relay
A6	—	—	Not Used
A7	—	—	Not Used
A8	—	—	Not Used
A9	—	—	Not Used
A10	—	—	Not Used
A11	WHT	352	Headlamp Relay
A12	PPL/WHT	1382	Dimming Disable
B1	DK GRN/WHT	817	VSS 4K/Input
B2	—	—	Not Used
B3	YEL	1836	Sensor Signal Passlock
B4	—	—	Not Used
B5	PPL	524	Hi Beam
B6	BRN	2409	Park Lamps
B7	—	—	Not Used
B8	—	—	Not Used
B9	LT GRN	80	Key In Ignition
B10	—	—	Not Used
B11	—	—	Not Used
B12	ORN	1732	Interior Lamp Request

Body Control Interface Module

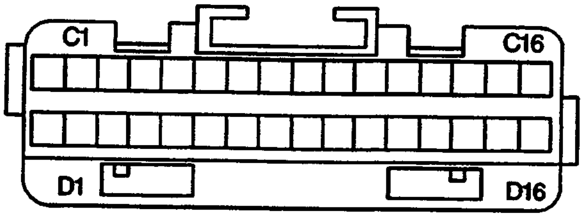


Connector Part Information	• **12041476** • **32 Way F Micro-Pack 100 Series (Blue)**

Pin	Wire Color	Circuit No	Function
C1	PNK	1020	Run 1
C2	WHT/BLK	2029	Wait Indicator Lamp
C3	BRN	541	Fused Output Ignition 3
C4	WHT	17	Stop Lamp Switch Output
C5	YEL	915	Power Use
C6	PPL	922	Wheel Speed Sensor Return Rear
C7	WHT	903	Wheel Speed Sensor Return Rear
C8	—	—	
C9	PPL	30	Fuel Gauge Sensor Return
C10	PNK	1020	Run 1
C11	WHT	2027	Vehicle Wake Up
C12	TAN	913	Low Fuel Indicator Lamp Output
C13	—	—	
C14	YEL	172	Low Fuel Indicator Lamp Output
C15	ORN	1740	Fused Output Battery
C16	ORN	5620	Service Now Tell Tale
D1	TAN	819	Ignition Switch Signal Run
D2	ORN	1054	Stop Lamp Switch
D3	YEL	492	Air Flow Sensor
D4	RED/BLK	645	Air Flow Return
D5	BLK/WHT	451	PCM Ground
D6	LT GRN	1395	A/C Switch Signal Vent Solenoid Control
D7	BRN	882CE	Wheel Speed Sensor Signal Rear
D8	RED	885CB	Wheel Speed Sensor Return Rear
D9	WHT	883CE	Wheel Speed Sensor Return Rear
D10	BLK	884CB	Wheel Speed Sensor Signal Rear
D11	PPL	5650	—
D12	YEL	268	Blower Enable Relay Output
D13	PPL	1397	A/C Switch Signal Heat Solenoid Control
D14	BLK	2901	Fuel Gauge Sensor Signal
D15	LT BLU	901	CM Interlock
D16	YEL/BLK	1827	Vehicle Speed Signal 128000 Pulses Per Mile

CONNECTOR END VIEWS

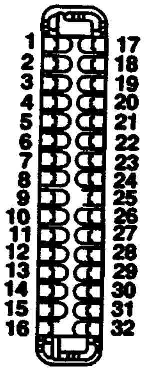
Heat Pump Ventilation System (HPVS)/Thermal Control Module (HTCM) C2



Connector Part Information		• 12045575 • 32 Way Micro-Pack 100 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
C1	LT BLU	901	CM Interlock
C2	DK BLU	5643	Ground Sense Reference Signal
C3	BLK/WHT	4906	Ground Sense Reference Signal
C4	GRY	910	Headlamp Switch Output
C5	YEL	5644	Charge Receptacle Coolant Valve Feedback
C6	TAN	819	Ignition Switch Signal Run
C7	PPL	5645	Outside Ambient Temperature Sensor Signal
C8	YEL	268	Blower Enable Relay Output
C9	PNK/BLK	4905	
C10	PNK	904	A/C Low Pressure Sensor Signal
C11	PNK	2014	Coolant Pump Relay Output Coil
C12	—	—	
C13	DK GRN	335	High Speed Blower Relay Feed Coil
C14	ORN	1740	Fused Output Battery
C15	WHT	606	HVAC Control Temperature Signal
C16	WHT	2016	Refrigerant Reversing Valve Control Signal
D1	—	—	Not Used
D2	—	—	Not Used
D3	—	—	Not Used
D4	PNK	39	IGN 1
D5	WHT	903	HTCM 5 Volt Reference Return
D6	TAN	800	Serial Data Link 1
D7	TAN	800	Serial Data Link 2
D8	BLK/WHT	251	Ground
D9	LT GRN	1395	A/C Switch Signal Vent Solenoid Control

Connector Part Information		• **12045575** • **32 Way Micro-Pack 100 Series (Black)**	
D10	DK GRN	1614	Air Inlet Valve Motor Feed
D11	BLK	351	Ground
D12	LT BLU	203	Air Conditioning Switch Output
D13	—	—	Not Used
D14	BLK	452	Sensor Return
D15	WHT	2027	Vehicle Wake Up
D16	BLK/WHT	451	PCM Ground

Power Inverter Module C1



Connector Part Information		• 12129025 • 32 Way F Micro-Pack 100 Series (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	BLK/WHT	451	PCM Ground
2	—	—	Not Used
3	PNK	239	Fused Output Ignition 1
4	DK GRN/WHT	817	VSS 4K/Input
5	TAN	1855	Service Soon Tell Tale
6	DK GRN WHT	1135	Brake Transmission Shift Interlock Solenoid Feed
7	ORN	1054	Stop Lamp Switch
8	DK GRN	2023	Charge Receptacle Paddle Present
9	DK BLU	84	Set
10	GRY	397	On
11	—	—	Not Used
12	LT GRN	968	APP3 Signal
13	PNK	965	APP2 Signal
14	TAN	962	APP1 Signal
15	DK GRN	969	APP3 5 Volt Reference
16	PPL	966	APP2 5 Volt Reference
17	BLK/WHT	451	PCM Ground
18	—	—	Not Used
19	PNK	1020	Run 1
20	ORN	1040	12 V Regulated
21	—	—	Not Used
22	TAN	800	Serial Data Link 1/Bus 1
23	TAN	800	Serial Data Link 2/Bus II
24	PPL	420	Brake Switch
25	GRY/BLK	87	R/A

Connector Part Information		• 12129025 • 32 Way F Micro-Pack 100 Series (Natural)	
26	BRN	241	Fused Output Ignition 3
27	—	—	Not Used
28	RED	967	APP3 Sensor Ground
29	BLK	964	APP2 Sensor Ground
30	WHT	963	APP1 Sensor Ground
31	YEL	961	APP1 5 Volt Reference
32	—	—	Not Used

CONNECTOR END VIEWS

Underhood Bussed Electrical Center (UBEC) C3

Drawing Not Available

Connector Part Information		• 12193916 • 32 Way F Metri-Pack 280 Series Flexlock (Red)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used
A2	—	—	Not Used
A3	—	—	Not Used
A4	—	—	Not Used
A5	—	—	Not Used
A6	—	—	Not Used
B1	—	—	Not Used
B2	—	—	Not Used
B3	LT GRN	1324	Backup Lamp Feed
B4	—	—	Not Used
B5	—	—	Not Used
B6	—	—	Not Used
C1	BRN	2509	Park Lamp Feed
C2	—	—	Not Used
C5	DK GRN	619	Stop, Turn Lamp Feed Rear
C6	—	—	Not Used
D1	—	—	Not Used
D2	BRN/WHT	2609	Park Lamp Feed
D5	—	—	Not Used
D6	YEL	618	Stop, Turn Lamp Feed Rear
E1	—	—	Not Used
E2	—	—	Not Used
E3	—	—	Not Used
E4	—	—	Not Used
E5	—	—	Not Used
E6	—	—	Not Used
F1	—	—	Not Used
F2	—	—	Not Used
F3	—	—	Not Used
F4	—	—	Not Used
F5	—	—	Not Used
F6	—	—	Not Used

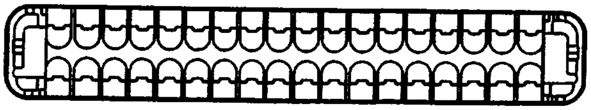
Underhood Bussed Electrical Center (UBEC) C4

Drawing Not Available

Connector Part Information		• 12193914 • 32 Way F Metri-Pack 280 Series Flexlock (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used
A2	DK GRN/WHT	711	High Headlamp Feed
A3	—	—	Not Used
A4	—	—	Not Used
A5	—	—	Not Used
A6	DK GRN	1329	Horn Feed
B1	YEL/BLK	712	Low Headlamp Feed
B2	DK BLU	198	Fused Output Headlamp
B3	YEL	525	Headlamp Switch Output Low Beam
B4	PPL	524	Hi Beam
B5	BRN	2309	Park Lamp Feed
B6	—	—	Not Used
C1	—	—	Not Used
C2	—	—	Not Used
C5	BRN	2309	Park Lamp Feed
C6	—	—	Not Used
D1	—	—	Not Used
D2	—	—	Not Used
D5	—	—	Not Used
D6	—	—	Not Used
E1	—	—	Not Used
E2	—	—	Not Used
E3	—	—	Not Used
E4	—	—	Not Used
E5	LT BLU	2114	Turn Signal Lamp Feed Front
E6	—	—	Not Used
F1	—	—	Not Used
F2	—	—	Not Used
F3	—	—	Not Used
F4	DK BLU	2115	Turn Signal Lamp Feed Front
F5	—	—	Not Used
F6	—	—	Not Used

CONNECTOR END VIEWS

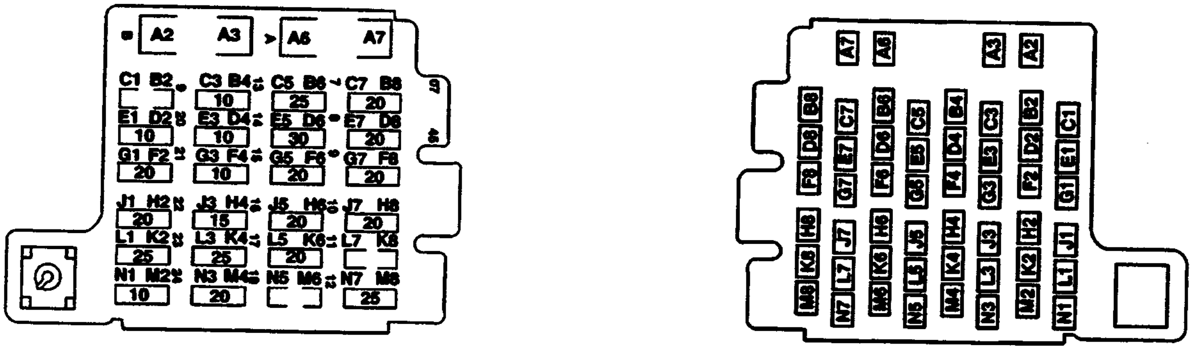
Automatic Disconnect Module



Connector Part Information		• 12110487 • 36 Way F Micro-Pack 100 W (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
1	WHT	942	Coolant Temperature Indicator Lamp Output
2	—	—	Not Used
3	RED	905	CM Interlock Return
4	YEL	917	Battery Life Tell Tale
5	—	—	Not Used
6	DK GRN	952	SIR Indicator Lamp Output
7	PNK	943	
8	DK BLU	945	State Of Charge Gauge Output
9	PPL	984	Power Use Gauge Output
10	—	—	Not Used
11	WHT	942	Ground
12	—	—	Not Used
13	—	—	Not Used
14	TAN	982	Transmission Range Indicator Switch Bit B Output
15	—	—	Not Used
16	—	—	Not Used
17	—	—	Not Used
18	RED	903	Fasten Belts Lamp Output
19	ORN	954	High Beam Indicator Lamp Feed Daytime Running Lamps

Connector Part Information		• 12110487 • 36 Way F Micro-Pack 100 W (Black)	
20	—	—	Not Used
21	LT BLU/BLK	918	Park Lamp Feed
22	YEL/BLK	985	Instrument Panel Lamp Feed
23	PPL/WHT	904	Ground
24	BRN	951	High Voltage Disconnect In
25	LT BLU	950	Charge Tell Tale Output
26	BLK	949	Low Fuel Indicator Lamp Output
27	LT GRN	937	Daytime Running Lamp Relay Output Coil
28	YEL	983	Fused Output Ignition 1
29	—	—	Not Used
30	—	—	Not Used
31	BLK/WHT	902	Fused Output Ignition 1
32	—	—	Not Used
33	—	—	Not Used
34	—	—	Not Used
35	LT BLU	901	CM Interlock
36	WHT	919	Transmission Range Indicator Switch Bit C Output

IP Fuse Block


A2
A3
A6
A7
C1 B2
C3 B4
C5 B6
C7 B8
10
25
20
E1 D2
E3 D4
E5 D6
E7 D8
10
10
30
20
G1 F2
G3 F4
G5 F6
G7 F8
20
10
20
20
J1 H2
J3 H4
J5 H6
J7 H8
20
15
20
20
L1 K2
L3 K4
L5 K6
L7 K8
25
25
20
N1 M2
N3 M4
N5 M6
N7 M8
10
20
25

Connector Part Information		• 12110746 • 52 Way F Asm, Fuse Block Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A2	—	—	Not Used
A3	—	—	Not Used
A6	—	—	Not Used
A7	—	—	Not Used
B2	RED	642	Fused Output Battery
B4	—	—	Not Used
B6	—	—	Not Used
B8	—	—	Not Used
C1	ORN	340	Fused Output Battery
C3	ORN	1040	12 V Regulated
C5	ORN	840	Fused Output Battery
C7	ORN	1940	Fused Output Battery
D2	RED	642	Fused Output Battery
D4	—	—	Not Used
D6	—	—	Not Used
D8	—	—	Not Used
E1	—	—	Not Used
E3	ORN	1740	Fused Output Battery
E5	ORN	40	Fused Output Battery
E7	ORN	640	Fused Output Battery
F2	ORN	300	Ignition
F4	—	—	Not Used
F6	—	—	Not Used
F8	—	—	Not Used
G1	—	—	Not Used
G3	—	—	Not Used
G5	BRN	141	Fused Output Ignition 3
G7	BRN	41	IGN 3
H2	ORN	300	Ignition
H4	—	—	Not Used

Connector Part Information		• **12110746** • **52 Way F Asm, Fuse Block Metri-Pack 280 Series (Black)**	
H6	—	—	Not Used
H8	PNK	3	Ignition Switch Output Ignition1
J1	BRN	441	Fused Output Ignition 3
J3	YEL	1139	Fused Output Ignition 1
J5	PNK	139	Fused Output Ignition 1
J7	PNK	39	IGN 1
K2	BRN	4	Ignition Switch Output Accessory
K4	—	—	Not Used
K6	WHT	1390	Ignition Switch Output Off/Run/Crank
K8	DK GRN	44	Instrument Panel Lamps Dimmer Output
L1	—	—	Not Used
L3	YEL	143	Fused Output Accessory
L5	PNK	1020	Run 1
L7	GRY	1220	Dimming Pot
M2	DK BLU	75	Delayed Accessory Bus Relay Output Com Contact Acc
M4	RED	642	Fused Output Battery
M6	LT BLU	74	Park Lamp Switch Output
M8	—	—	Not Used
N1	DK GRN	1301	Fused Output Retained Accessory Power
N3	ORN	1840	• Fused Output Battery
N5	BRN	2409	Park Lamps
N7	—	—	

CONNECTOR END VIEWS

Body Bussed Electrical Center (BBEC)

Drawing Not Available

Connector Part Information		• 12193905 • 68 Way F Asm, Fuse Block Metri-Pack 280 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used
A2	—	—	Not Used
A3	—	—	Not Used
A4	ORN	40	Fused Output Battery
A5	ORN	40	Fused Output Battery
A6	—	—	Not Used
A7	—	—	Not Used
A8	—	—	Not Used
A9	—	—	Not Used
A10	—	—	Not Used
A11	WHT	1080	Park Lamp Relay
A12	—	—	Not Used
B1	—	—	Not Used
B2	—	—	Not Used
B3	—	—	Not Used
B4	BLK/WHT	451	PCM Ground
B5	BLK/WHT	451	PCM Ground
B6	BLK/WHT	451	PCM Ground
B7	BLK/WHT	451	PCM Ground
B8	—	—	Not Used
B9	—	—	Not Used
B10	—	—	Not Used
B11	—	—	Not Used
B12	—	—	Not Used
C1	—	—	Not Used
C2	—	—	Not Used
C3	—	—	Not Used
C4	DK BLU	1393	Inadvertent Power
C5	ORN	1732	Interior Lamp Request

Connector Part Information		• **12193905** • **68 Way F Asm, Fuse Block Metri-Pack 280 Series (Gray)**	
C8	BLK	1850	TBC Ground
C9	—	—	Not Used
C10	ORN	240	Fused Output Battery
C11	LT BLU	74	Park Lamp Switch Output
C12	—	—	Not Used
D1	—	—	Not Used
D2	BRN	4	Ignition Switch Output Accessory
D3	—	—	Not Used
D4	WHT	156	Courtesy Lamp Output
D5	—	—	Not Used
D8	—	—	Not Used
D9	—	—	Not Used
D10	—	—	Not Used
D11	—	—	Not Used
D12	—	—	Not Used
E1	RED	542	Battery Fused
E2	BLK	755	RAP Relay
E3	BRN	4	Ignition Switch Output Accessory
E4	WHT	156	Courtesy Lamp Output
E5	ORN	1732	Interior Lamp Request
E6	—	—	Not Used
E7	—	—	Not Used
E8	—	—	Not Used
E9	—	—	Not Used
E10	—	—	Not Used
E11	—	—	Not Used
E12	—	—	Not Used
F1	—	—	Not Used
F2	—	—	Not Used
F3	DK BLU	75	Delayed Accessory Bus Relay Output Com Contact Acc
F4	GRY/BLK	690	Courtesy Lamp Relay
F5	—	—	Not Used
F6	—	—	Not Used
F7	—	—	Not Used
F8	—	—	Not Used
F9	—	—	Not Used
F10	—	—	Not Used
F11	—	—	Not Used
F12	—	—	Not Used

CONNECTOR END VIEWS

Underhood Bussed Electrical Center (UBEC) - C1

Drawing Not Available

Connector Part Information		• 12193905 • 68 Way F Asm Metri-Pack 280 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used
A2	ORN	740	Fused Output Battery
A3	PPL	524	Hi Beam
A4	LT BLU	74	Park Lamp Switch Output
A5	—	—	Not Used
A6	LT GRN/BLK	592	DRL Relay
A7	BLK	350	Ground
A8	—	—	Not Used
A9	PNK	3	Ignition Switch Output Ignition1
A10	BRN	541	Fused Output Ignition 3
A11	—	—	Not Used
A12	—	—	Not Used
B1	YEL/BLK	895	CHMSL Relay Output Common Contact
B2	—	—	Not Used
B3	—	—	Not Used
B4	—	—	Not Used
B5	—	—	Not Used
B6	YEL	10	Headlamp Switch Output
B7	BLK	350	Ground
B8	—	—	Not Used
B9	—	—	Not Used
B10	—	—	Not Used
B11	RED	242	Fused Output Battery
B12	ORN	240	Fused Output Battery
C1	—	—	Not Used
C2	—	—	Not Used
C3	—	—	Not Used
C4	—	—	Not Used
C5	WHT	352	Headlamp Relay
C8	—	—	Not Used
C9	ORN	1640	Fused Output Battery
C10	DK GRN/WHT	1419	Turn Signal Switch Output Rear

Connector Part Information		**• 12193905** **• 68 Way F Asm Metri-Pack 280 Series (Gray)**	
C11	—	—	Not Used
C12	—	—	Not Used
D1	—	—	Not Used
D2	—	—	Not Used
D3	—	—	Not Used
D4	—	—	Not Used
D5	—	—	Not Used
D8	—	—	Not Used
D9	PNK	639	Fused Output Ignition 1
D10	—	—	Not Used
D11	WHT	17	Stop Lamp Switch Output
D12	ORN	540	Fused Output Battery
E1	ORN	1140	Batt Pwr
E2	ORN	140	Fused Output Battery
E3	BLK	28	Horn Relay
E4	—	—	Not Used
E5	—	—	Not Used
E6	—	—	Not Used
E7	BLK/WHT	451	PCM Ground
E8	BLK/WHT	451	PCM Ground
E9	—	—	Not Used
E10	—	—	Not Used
E11	—	—	Not Used
E12	—	—	Not Used
F1	—	—	Not Used
F2	—	—	Not Used
F3	—	—	Not Used
F4	DK BLU/WHT	1415	RF Turn Signal
F5	LT BLU/WHT	1414	LF Turn Signal
F6	—	—	Not Used
F7	YEL	525	Headlamp Switch Output Low Beam
F8	—	—	Not Used
F9	—	—	Not Used
F10	YEL/BLK	1418	Turn Signal Switch Output Rear
F11	LT BLU	1320	Fused Output CHMSL
F12	ORN	1540	Fused Output Battery

CONNECTOR END VIEWS

Underhood Bussed Electrical Center (UBEC) - C2

Drawing Not Available

Connector Part Information		• 12193906 • 68 Way F Asm Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used
A2	—	—	Not Used
A3	—	—	Not Used
A4	—	—	Not Used
A5	—	—	Not Used
A6	BRN	250	Ground
A7	BRN	241	Fused Output Ignition 3
A8	—	—	Not Used
A9	—	—	Not Used
A10	—	—	Not Used
A11	—	—	Not Used
A12	—	—	Not Used
B1	—	—	Not Used
B2	—	—	Not Used
B3	DK BLU/WHT	925	—
B4	TAN	913	—
B5	—	—	Not Used
B6	—	—	Not Used
B7	—	—	Not Used
B8	—	—	Not Used
B9	PNK	239	Fused Output Ignition 1
B10	—	—	Not Used
B11	GRY	1524	Backup Lamp Feed
B12	—	—	Not Used
C1	—	—	Not Used
C2	—	—	Not Used
C3	—	—	Not Used
C4	—	—	Not Used
C5	—	—	Not Used
C8	—	—	Not Used
C9	—	—	Not Used
C10	—	—	Not Used
C11	—	—	Not Used
C12	—	—	Not Used

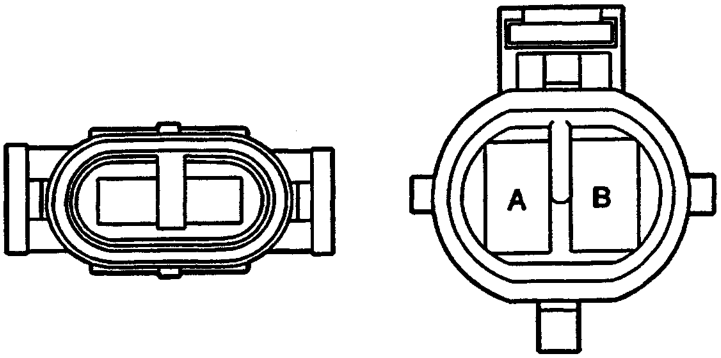
Connector Part Information		• 12193906 • 68 Way F Asm Metri-Pack 280 Series (Black)	
D1	—	—	Not Used
D2	—	—	Not Used
D3	—	—	Not Used
D4	—	—	Not Used
D5	—	—	Not Used
D8	—	—	Not Used
D9	—	—	Not Used
D10	—	—	Not Used
D11	—	—	Not Used
D12	—	—	Not Used
E1	—	—	Not Used
E2	—	—	Not Used
E3	—	—	Not Used
E4	—	—	Not Used
E5	—	—	Not Used
E6	—	—	Not Used
E7	BLK/WHT	451	PCM Ground
E8	—	—	Not Used
E9	—	—	Not Used
E10	—	—	Not Used
E11	—	—	Not Used
E12	—	—	Not Used
F1	—	—	Not Used
F2	—	—	Not Used
F3	—	—	Not Used
F4	—	—	Not Used
F5	—	—	Not Used
F6	—	—	Not Used
F7	BLK	250	Ground
F8	—	—	Not Used
F9	—	—	Not Used
F10	—	—	Not Used
F11	—	—	Not Used
F12	—	—	Not Used

In-line Connector C109

Drawing Not Available

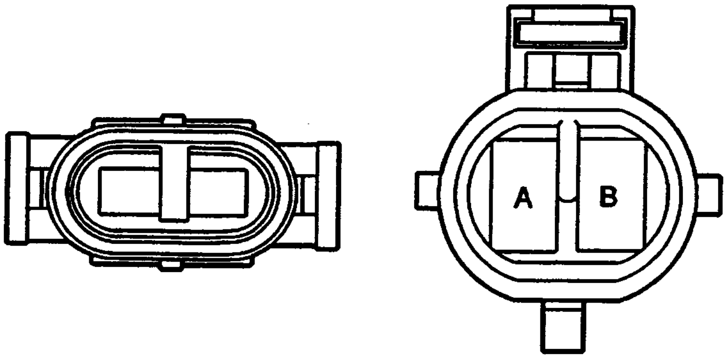
Connector Part Information		• 12077988 • 2 Way F Metri-Pack 280 Series (Yellow)		Connector Part Information		• 12084180 • 2 Way M Metri-Pack 280 Series Sealed (Yellow)	
Pin	Wire Color	Circuit No	Function	Pin	Wire Color	Circuit No	Function
A	YEL	1834	SIR Forward Sensor Signal	A	YEL	1834	SIR Forward Sensor Signal
B	BLK/WHT	1851	SIR Ground	B	BLK/WHT	1851	SIR Ground

In-line Connector C116



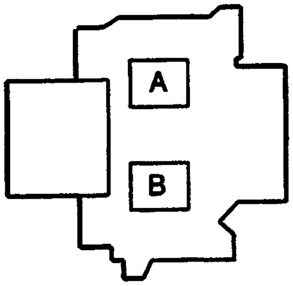
Connector Part Information		• 12124819 • 2 Way F Metri-Pack 280 Series (Black)		Connector Part Information		• 12103483 • 2 Way M Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	BRN	718	Sensor Return	A	WHT	1104	Ground Sense Signal
B	BLK/WHT	251	Ground	B	BLK	452	Sensor Return

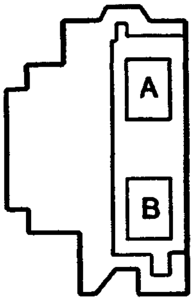
In-line Connector C117



Connector Part Information	• 12124819 • 2 Way F Metri-Pack 280 Series (Black)			Connector Part Information	• 12103483 • 2 Way M Metri-Pack 280 Series (Black)		
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	PPL	719	Sensor Return	A	WHT	1104	Ground Sense Signal
B	BLK/WHT	351	Ground	B	BLK	452	Sensor Return

In-line Connector C200

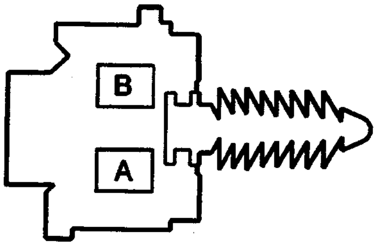




Connector Part Information		**• 12092850 • 2 Way F Metri-Pack 280.1 Series P2S (Gray)**		**Connector Part Information**		**• 12162468 • 2 Way M Metri-Pack 280 Series (Yellow)**	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	WHT/BLK	1403	SIR Inflator Feed Driver	A	WHT/BLK	1403	SIR Inflator Feed Driver
B	DK GRN/WHT	1404	SIR Inflator Output Driver	B	DK GRN/WHT	1404	SIR Inflator Output Driver

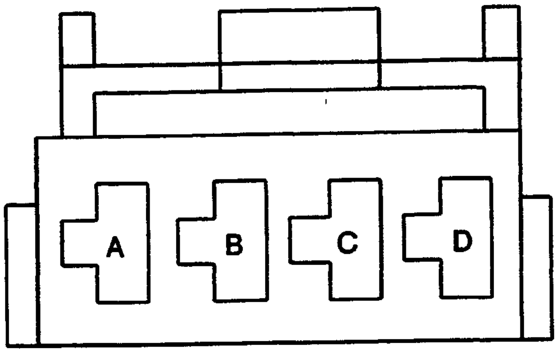
CONNECTOR END VIEWS

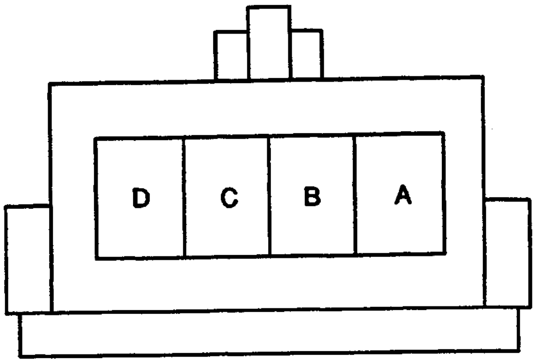
In-line Connector C214



Connector Part Information		• 2 Way F Metri-Pack 280 Series (Yellow)		Connector Part Information		• 12162317 • 2 Way M Metri-Pack 280 Series (Yellow)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	WHT	347	SIR Inflator Feed Driver	A	WHT	347	SIR Inflator Feed Driver
B	DK GRN	348	SIR Inflator Output Driver	B	DK GRN	348	SIR Inflator Output Driver

In-line Connector C204

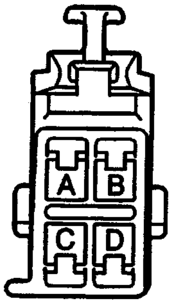




Connector Part Information		• 12015664 • 4 Way F Metri-Pack 630 Series (Black)		Connector Part Information		• 15317729 • 4 Way M Metri-Pack 630 Series (Black)	
Pin	Wire Color	Circuit No	Function	Pin	Wire Color	Circuit No	Function
A	BRN	4	IGN Acc	A	BRN	4	IGN Acc
B	DK BLU	75	DAB Relay Acc	B	DK BLU	75	DAB Relay Acc
C	ORN	300	IGN 3	C	ORN	300	IGN 3
D	RED	642	Battery	D	RED	642	Battery

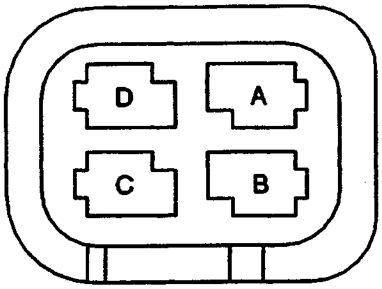
CONNECTOR END VIEWS

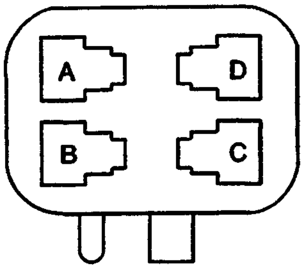
In-line Connector C213



Connector Part Information		• 12092162 • 4 Way F Metri-Pack 150 Series (Black)		Connector Part Information		• 12129135 • 4 Way M Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used	A	—	—	Not Used
B	BLK	1050	Ground	B	BLK	1050	Ground
C	ORN	640	Battery	C	ORN	640	Battery
D	BRN	2409	Park Lamps	D	BRN	2409	Park Lamps

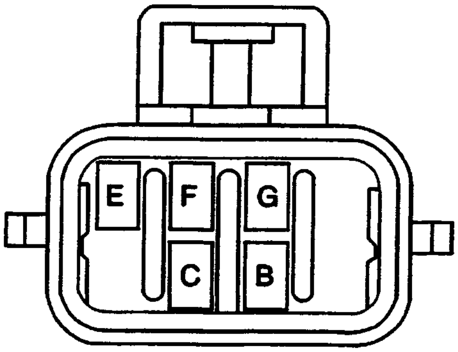
In-line Connector C214

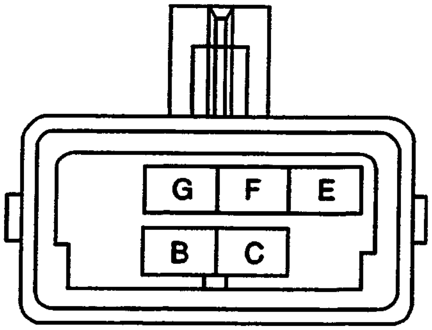




Connector Part Information		• N/A • 4 Way F Metri-Pack 150 Series (Natural)		Connector Part Information		• 12089247 • 4 Way M Metri-Pack 150 Series (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	BLK/WHT	771	Transmission Range Indicator Switch Bit A Output	A	BLK/WHT	771	Transmission Range Indicator Switch Bit A Output
B	YEL	772	Transmission Range Indicator Switch Bit B Output	B	YEL	772	Transmission Range Indicator Switch Bit B Output
C	GRY	773	Transmission Range Indicator Switch Bit C Output	C	GRY	773	Transmission Range Indicator Switch Bit C Output
D	WHT	776	PRND Parity	D	WHT	776	PRND Parity

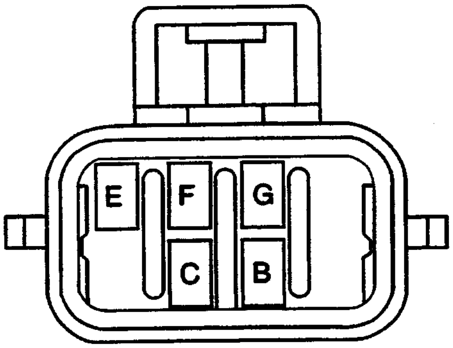
In-line Connector C104

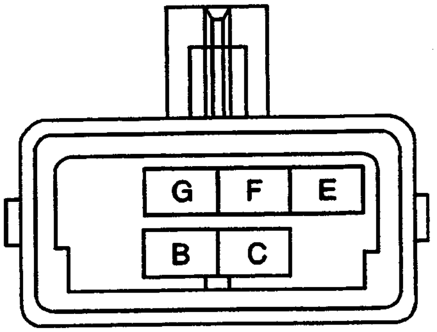




Connector Part Information		• 12052600 • 5 Way F Metri-Pack 150 Series Sealed (Med Gray)		Connector Part Information		• 12052480 • 5 Way M Metri-Pack 150 Series Sealed (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
B	BRN	882CE	Wheel Speed Sensor Signal RR	B	BRN	882CE	Wheel Speed Sensor Signal RR
C	BLK	884CB	Wheel Speed Sensor Signal LR	C	BLK	884CB	Wheel Speed Sensor Signal LR
E	ORN	5620	Fused Output Battery	E	ORN	5620	Fused Output Battery
F	RED	885CB	Wheel Speed Sensor Return LR	F	RED	885CB	Wheel Speed Sensor Return LR
G	WHT	883CE	Wheel Speed Sensor Return RR	G	WHT	883CE	Wheel Speed Sensor Return RR

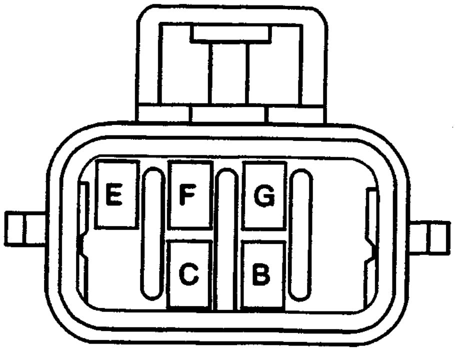
In-line Connector C111

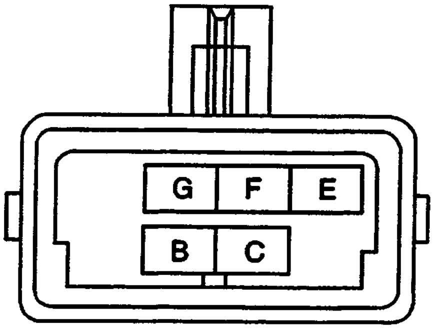




Connector Part Information		• 12052600 • 5 Way F Metri-Pack 150 Series Sealed (Gray)		Connector Part Information		• 12052480 • 5 Way M Metri-Pack 150 Series (Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
B	BLK	850	Ground	B	BLK	850	Ground
C	WHT	2016	HTCM Reversing Valve Feed	C	WHT	2016	HTCM Reversing Valve Feed
E	BLK	2901	Power Use Signal	E	BLK	2901	Power Use Signal
F	ORN	840	Battery	F	ORN	840	Battery
G	PPL	1397	A/C Heat Solenoid Control	G	PPL	1397	A/C Heat Solenoid Control

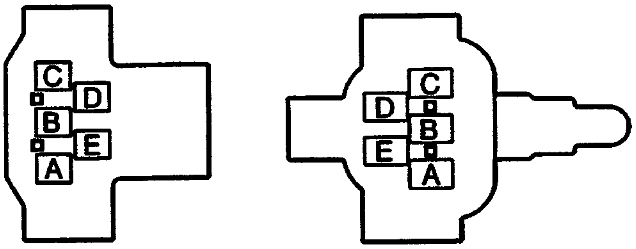
In-line Connector C301





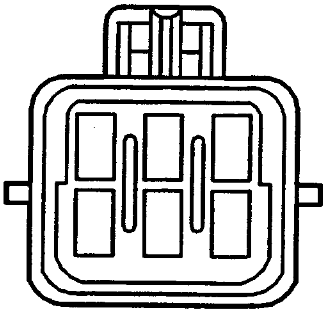
Connector Part Information		• 12052600 • 5 Way F Metri-Pack 150 Series (Gray)		Connector Part Information		• 12059246 • 5 Way M Metri-Pack 150 Series (Dk Gray)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
B	BRN	882CE	Wheel Speed Sensor Signal Rear	B	BRN	882CE	Wheel Speed Sensor Signal Rear
C	BLK	884CB	Wheel Speed Sensor Signal Rear	C	BLK	884CB	Wheel Speed Sensor Signal Rear
E	—	—	Blocked	E	—	—	Blocked
F	RED	885CB	Wheel Speed Sensor Return Rear	F	RED	885CB	Wheel Speed Sensor Return Rear
G	WHT	883CE	Wheel Speed Sensor Return Rear	G	WHT	883CE	Wheel Speed Sensor Return Rear

In-line Connector C400



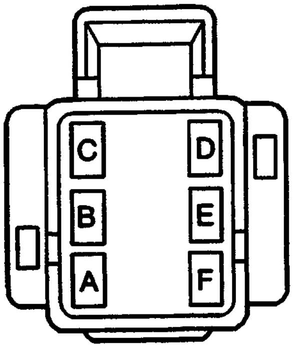
Connector Part Information		• 12146045 • 5 Way F Metri-Pack 150 Series (Natural)		Connector Part Information		• 12103974 • 5 Way M Metri-Pack 150 Series (Natural)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	BRN	2509	Park Lamp LR	A	BRN	2509	Park Lamp LR
B	LT GRN	1324	Backup Lamps	B	LT GRN	1324	Backup Lamps
C	DK GRN	619	Turn/Stop Lamp RR	C	DK GRN	619	Turn/Stop Lamp RR
D	YEL	618	Turn/Stop Lamp LR	D	YEL	618	Turn/Stop Lamp LR
E	BRN/WHT	2609	Park Lamp RR	E	BRN/WHT	2609	Park Lamp RR

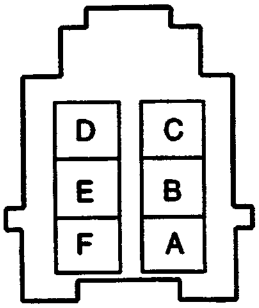
In-line Connector C101



Connector Part Information		• 12052848 • 6 Way F Metri-Pack 150 Series Sealed (Black)		Connector Part Information		• 12186125 • 6 Way M Metri-Pack 150 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	WHT	2027	Vehicle Wake Up	A	WHT	2027	Vehicle Wake Up
B	DK BLU	925	Battery Air Flow Sensor Signal	B	DK BLU/WHT	925	Battery Air Flow Sensor Signal
C	WHT	5646	Charge Receptacle Temp 5V Ref	C	WHT/BLK	5646	Charge Receptacle Temp 5V Ref
D	BLK/WHT	451	PCM Ground	D	BLK/WHT	451	PCM Ground
E	—	—	Not Used	E	—	—	Not Used
F	DK BLU	660	Charge Receptacle Temp	F	DK BLU	660	Charge Receptacle Temp

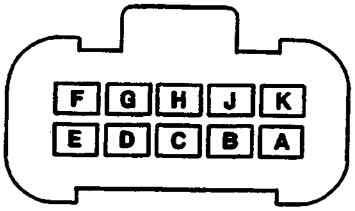
In-line Connector C207

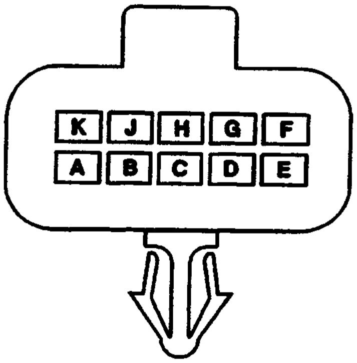




Connector Part Information		• 12064752 • 6 Way F Metri-Pack 280 Series (Black)		Connector Part Information		• 12064754 • 6 Way M Metri-Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used	A	—	—	Not Used
B	BLK	1850	TBC Ground	B			
C	—	—	Not Used	C	—	—	Not Used
D	—	—	Not Used	D	—	—	Not Used
E	BLK/WHT	238	Seat Belt Switch	E	LT BLU	72	Blower Med 2
F	—	—	Not Used	F	—	—	Not Used

In-line Connector C107

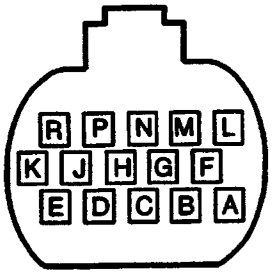


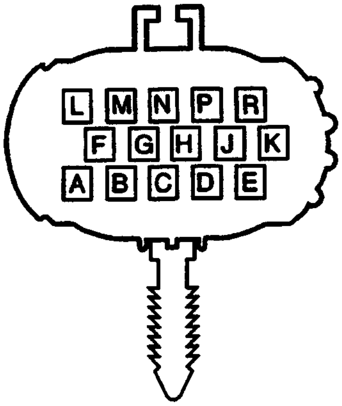


Connector Part Information		• 12065425 • 10 Way F Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL	961	APP1 5 Volt Reference
B	TAN	962	APP1 Signal
C	WHT	963	APP1 Sensor Ground
D	BLK	964	APP2 Sensor Ground
E	PNK	965	APP2 Signal
F	PPL	966	APP2 5 Volt Reference
G	RED	967	APP3 Sensor Ground
H	LT GRN	968	APP3 Signal
J	DK GRN	969	APP3 5 Volt Reference
K	DK BLU	84	Set

Connector Part Information		• 12045808 • 10 Way M Metri-Pack 150 Series Sealed (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**
A	YEL	961	APP1 5 Volt Reference
B	TAN	962	APP1 Signal
C	WHT	963	APP1 Sensor Ground
D	BLK	964	APP2 Sensor Ground
E	PNK	965	APP2 Signal
F	PPL	966	APP2 5 Volt Reference
G	RED	967	APP3 Sensor Ground
H	LT GRN	968	APP3 Signal
J	DK GRN	969	APP3 5 Volt Reference
K	DK BLU	84	Set

In-line Connector C103

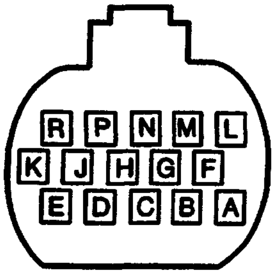


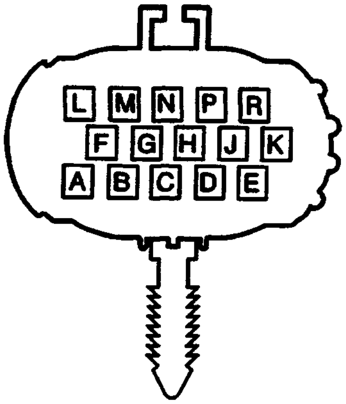


Connector Part Information		• 12110779 • 15 Way F Metri-Pack 280 Series Flexlock Sealed		Connector Part Information		• 12110781 • 15 Way M Metri-Pack 280 Series Sealed	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used	A	ORN	1840	Battery
B	PPL	5640	Serial Data Signal UART 8192 Baud Primary	B	PPL	5650	Serial Data Signal UART 8192 Baud Primary
C	ORN/BLK	840	Battery	C	ORN	840	Battery
D	GRY/BLK	924	Fuel Gauge Sensor Signal	D	—	PN#12010300	Not Used
E	YEL/BLK	915	Power Use	E	YEL	915	Power Use
F	PPL	30	Fuel Gauge Sensor	F	PPL	30	Fuel Gauge Sensor
G	ORN	940	Battery	G	ORN	940	Battery
H	BLK/WHT	950	Battery Feed	H	BLK	950	Battery Feed
J	PNK	1020	Run 1	J	PNK	1020	Run 1
K	TAN/BLK	800	Serial Data Link/Bus	K	TAN	800	Serial Data Link/Bus
L	LT GRN	275	Park Select	L	LT GRN/BLK	275	Park Select
M	PPL/WHT	1807	Class 2 BUS	M	PPL	1807	Class 2 BUS
N	TAN	800	Serial Data Link/Bus	N	TAN	800	Serial Data Link/Bus
P	YEL	492	Air Flow Sensor	P	YEL	492	Air Flow Sensor
R	RED/BLK	645	Air Flow Return	R	RED/BLK	645	Air Flow Return

CONNECTOR END VIEWS

In-line Connector C105





Connector Part Information		• **12110779** • **15 Way F Metri-Pack 280 Series Flexlock Sealed**		**Connector Part Information**		• **12110781** • **15 Way M Metri-Pack 280 Series Sealed**	
Pin	**Wire Color**		**Function**	**Pin**	**Wire Color**		**Function**
A	PPL	5649	Cruise Control On Switch Output	A	PPL	5649	Cruise Control On Switch Output
B	LT GRN/BLK	735	Outside Ambient Temp Signal	B	LT GRN/BLK	735	Outside Ambient Temp Signal
C	YEL	410	Coolant Temp Sensor Signal	C	YEL	410	Coolant Temp Sensor Signal
D	GRY	605	5V Ref	D	GRY	605	5V Ref
E	PNK	2014	Coolant Pump Relay Output	E	PNK	2014	Coolant Pump Relay Output
F	ORN	1640	Battery	F	ORN	1640	Battery
G	TAN	5648	Brake Pedal Switch Output	G	TAN	5648	Brake Pedal Switch Output
H	BLK/WHT	4906	Cruise Control Set/Coast Switch Signal	H	BLK/WHT	4906	Cruise Control Set/Coast Switch Signal
J	YEL	5644	Cruise Control Resume/Accel Switch Signal	J	YEL	5644	Cruise Control Resume/Accel Switch Signal
K	PPL	5645	Ground	K	PPL	5645	Ground
L	PNK/BLK	4905	Serial Data Signal Class B 10400 Baud Primary	L	PNK/BLK	4905	Serial Data Signal Class B 10400 Baud Primary
M	GRY	1524	Backup Lamp Feed	M	GRY	1524	Backup Lamp Feed
N	DK GRN	335	Coolant Fan Relay Output	N	DK GRN	335	Coolant Fan Relay Output

Connector Part Information		**• 12110779 • 15 Way F Metri-Pack 280 Series Flexlock Sealed**		**Connector Part Information**		**• 12110781 • 15 Way M Metri-Pack 280 Series Sealed**	
P	TAN	800	Serial Data Link/Bus	P	TAN	800	Serial Data Link/Bus
R	GRY/BLK	87	R/A	R	GRY/BLK	87	R/A

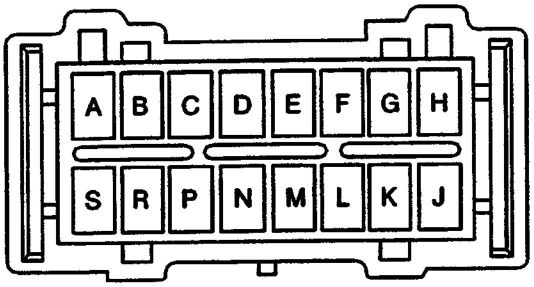
CONNECTOR END VIEWS

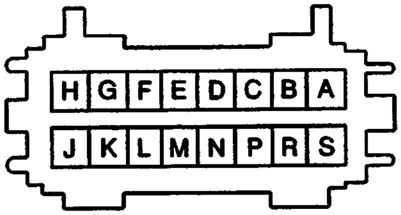
In-line Connector C205

Drawing Not Available

Connector Part Information		• 15305133 • 16 Way F GT 150, 280, Series (Black)		Connector Part Information		• 15305132 • 16 Way M GT 150, 280, Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used	A	—	—	Not Used
B	—	—	Not Used	B	—	—	Not Used
C	BLK	1850	TBC Ground	C	BLK	1850	TBC Ground
D	—	—	Not Used	D	—	—	Not Used
E	LT BLU	1320	CHMSL Output	E	LT BLU	1320	CHMSL Output
F	—	—	Not Used	F	—	—	Not Used
G	—	—	Not Used	G	—	—	Not Used
H	—	—	Not Used	H	—	—	Not Used
J	—	—	Not Used	J	—	—	Not Used
K	—	—	Not Used	K	ORN	1732	Interior Lamp Request
L	WHT	156	Courtesy Lamp	L	WHT	156	Courtesy Lamp
M	—	—	Not Used	M	—	—	Not Used
N	—	—	Not Used	N	—	—	Not Used
P	—	—	Not Used	P	—	—	Not Used
R	ORN	40	Battery	R	ORN	40	Battery
S	—	—	Not Used	S	—	—	Not Used

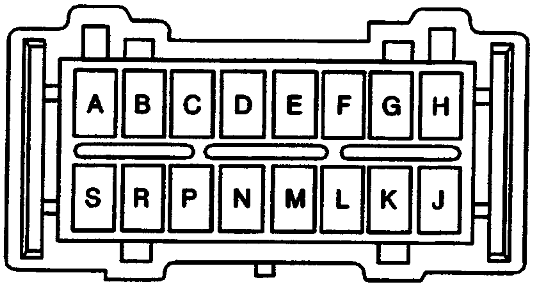
In-line Connector C500

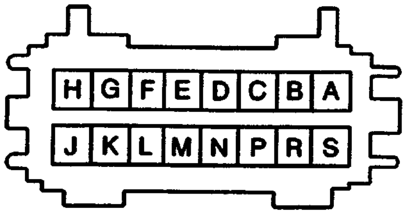




Connector Part Information		• 12129431 • 16 Way F Advanced Connector Technology 280 Series (Black)		Connector Part Information		• 12129427 • 16 Way M Advanced Connector Technology 280 Series (Black)	
Pin	Wire Color	Circuit No	Function	Pin	Wire Color	Circuit No	Function
A	—	—	Not Used	A	—	—	Not Used
B	—	—	Not Used	B	—	—	Not Used
C	—	—	Not Used	C	—	—	Not Used
D	—	—	Not Used	D	—	—	Not Used
E	—	—	Not Used	E	—	—	Not Used
F	—	—	Not Used	F	—	—	Not Used
G	—	—	Not Used	G	—	—	Not Used
H	—	—	Not Used	H	—	—	Not Used
J	—	—	Not Used	J	—	—	Not Used
K	—	—	Not Used	K	—	—	Not Used
L	—	—	Not Used	L	—	—	Not Used
M	—	—	Not Used	M	—	—	Not Used
N	—	—	Not Used	N	—	—	Not Used
P	—	—	Not Used	P	—	—	Not Used
R	YEL	116	Speaker Return LR	R	YEL	116	Speaker Return LR
S	BRN	199	Speaker Feed LR	S	BRN	199	Speaker Feed LR

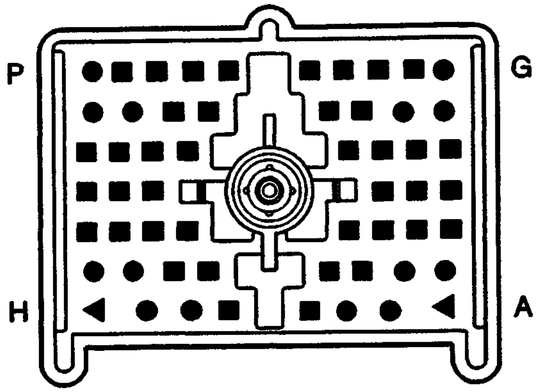
In-line Connector C600





Connector Part Information		• 12129431 • 16 Way F Advanced Connector Technology 280 Series (Black)		Connector Part Information		• 12129427 • 16 Way M Advanced Connector Technology 280 Series (Black)	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	—	—	Not Used	A	—	—	Not Used
B	—	—	Not Used	B	—	—	Not Used
C	—	—	Not Used	C	—	—	Not Used
D	—	—	Not Used	D	—	—	Not Used
E	—	—	Not Used	E	—	—	Not Used
F	—	—	Not Used	F	—	—	Not Used
G	—	—	Not Used	G	—	—	Not Used
H	—	—	Not Used	H	—	—	Not Used
J	—	—	Not Used	J	—	—	Not Used
K	—	—	Not Used	K	—	—	Not Used
L	—	—	Not Used	L	—	—	Not Used
M	—	—	Not Used	M	—	—	Not Used
N	—	—	Not Used	N	—	—	Not Used
P	—	—	Not Used	P	—	—	Not Used
R	LT BLU	115	Speaker Return RR	R	LT BLU	115	Speaker Return RR
S	DK BLU	46	Speaker Feed RR	S	DK BLU	46	Speaker Feed RR

In-Line Connector C211



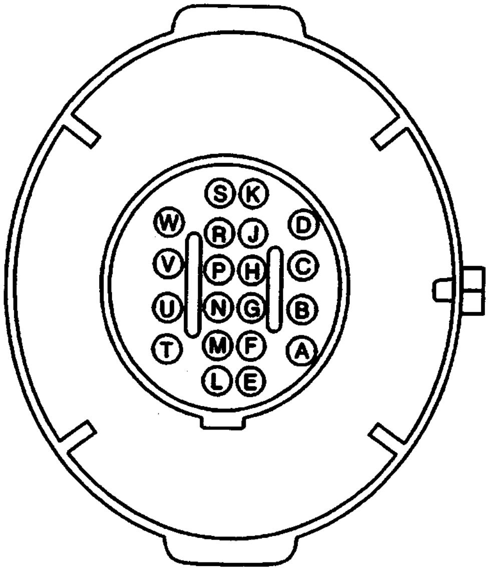
Connector Part Information		**• 12047842 • 17 Way F Metri-Pack Junction Systems (Black)**		**Connector Part Information**		**• 12077822 • 48 Way M Metri-Pack Mixed (Black)**	
				Connector Part Information		**• 12084183 • 18 Way F Metri-Pack Mixed (Gray)**	
				Connector Part Information		**• 12047840 • 13 Way F Metri-Pack Junction Systems (Black)**	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used	A1	—	—	Not Used
A2	PPL	16	Turn Signal Flasher Output	A2	PNK	139	IGN 1
A3	LT BLU	1508	Turn/Hazard Module Feed	A3	LT BLU	1508	Turn/Hazard Module Feed
A4				A4	ORN	140	Battery
A5	—			A5	PPL	1697	Turn/Hazard Module
A6	DK BLU	15	Park Lamp Feed	A6	DK BLU/WHT	1415	RF Turn Signal

CONNECTOR END VIEWS

Connector Part Information		**• 12047842 • 17 Way F Metri-Pack Junction Systems (Black)**		**Connector Part Information**		**• 12077822 • 48 Way M Metri-Pack Mixed (Black)**	
				Connector Part Information		**• 12084183 • 18 Way F Metri-Pack Mixed (Gray)**	
				Connector Part Information		**• 12047840 • 13 Way F Metri-Pack Junction Systems (Black)**	
A7	LT BLU	14	Turn Signal Lamp Feed Front	A7	LT BLU/WHT	1414	LF Turn Signal
A8	—	—	Not Used	A8	—	—	Not Used
A9	—		—	A9	ORN/BLK	1786	Transmission Park/Neutral Signal
A10			—	A10	YEL/BLK	895	CHMSL Relay
A11	BLK	28	HORN Relay	A11	BLK	28	HORN Relay
A12	GRY	397	On	A12	GRY	397	On
A13	BRN	441	IGN 3	A13	BRN	41	IGN 3
A14	DK BLU	84	Set	A14	DK BLU	84	Set
A15	GRY/BLK	87	R/A	A15	GRY	87	R/A
A16	BLK	150	Ground	A16	DK GRN/WHT	1135	BTSI Solenoid Feed
A17	DK GRN/WHT	1135	BTSI Solenoid Feed	A17	PNK	39	IGN 1
B1		—	—	B1	RED	242	Battery
B2	—	—	Not Used	B2	—	—	Not Used
B3	LT GRN	80	Key In Ignition	B3	LT GRN	80	Key In Ignition
B4	TAN	159	Key Reminder Switch Output	B4	BLK	1850	TBC Ground
B5	—	—	Not Used	B5	—	—	Not Used
B6	—	—	Not Used	B6	—	—	Not Used
C1	WHT	1390	IGN Off/Run/Crank	C1	WHT	1390	IGN Off/Run/Crank
C2	BLK/WHT	151	Ground	C2	RED/WHT	812	12V Ref
C3	—		—	C3	GRY	705	Ambient Light Sensor
C4		—		C4	ORN/BLK	1057	Analog Return
C5	PNK	3	IGN 1	C5	PNK	3	IGN 1
C6	ORN	300	IGN 3	C6	ORN	300	IGN 3
D1	—	—	Not Used	D1	—	—	Not Used
D2	RED	1342	Fused Output Battery	D2	RED	342	Battery
D3		—	—	D3	YEL	1836	Sensor Signal Passlock
D4	—	—	Not Used	D4	—	—	Not Used
D5	RED	1442	Fused Output Battery	D5	ORN	740	Battery
D6	BRN	4	IGN Acc	D6	BRN	4	IGN Acc

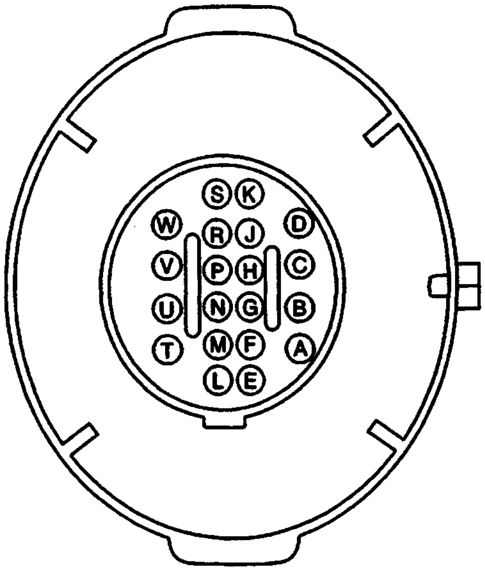
Connector Part Information	**• 12047842 • 17 Way F Metri-Pack Junction Systems (Black)**			**Connector Part Information**	**• 12077822 • 48 Way M Metri-Pack Mixed (Black)**		
				Connector Part Information	**• 12084183 • 18 Way F Metri-Pack Mixed (Gray)**		
				Connector Part Information	**• 12047840 • 13 Way F Metri-Pack Junction Systems (Black)**		
E1	LT BLU	1508	Turn/Hazard Module Feed	E1	GRY	1696	Turn/Hazard Module Feed
E2	LT BLU	20	Stoplamp Feed	E2	BLK	1850	TBC Ground
E3	PPL	92	Windshield Wiper Motor Feed High Speed	E3	PPL	92	Windshield Wiper Motor Feed High Speed
E4	YEL	143	Accessory	E4	YEL	143	Accessory
E5	BRN	96	Windshield Wiper Switch Signal Pulse Delay	E5	GRY	112	Windshield Wiper Switch Signal Pulse Delay
E6	DK GRN	19	Stop, Turn Lamp Feed Rear	E6	DK GRN/WHT	1419	Turn Signal RR
E7	YEL	18	Stop, Turn Lamp Feed Rear	E7	YEL/BLK	1418	Turn Signal LR
E8	BRN	27	Hazard Flasher Output	E8	DK GRN	113	Windshield Wiper Switch
E9	LT BLU	1508	Turn/Hazard Module Feed	E9	RED	228	Windshield Washer Pump
E10	—	—	Not Used	E10	—	—	Not Used
E11	LT GRN	11	High Beam Headlamp Feed	E11	PPL	524	Hi Beam
E12	TAN	12	Low Beam Headlamp Feed	E12	YEL	525	Dimmer Output
E13	YEL	10	Headlamp Switch Output	E13	YEL	10	Headlamp Switch Output

In-line Connector C106



Connector Part Information		• 12160280 • 20 Way F Micro-Pack 100 W Sealed (Gray)		Connector Part Information		• 12160542 • 20 Way M Micro-Pack 100 W (Gray)	
Pin	Wire Color	Circuit No	Function	Pin	Wire Color	Circuit No	Function
A	TAN	1855	Service Soon Tell Tale	A	TAN	1855	Service Soon Tell Tale
B	DK BLU	5643	Stop Lamp Switch Output	B	DK BLU	5643	Stop Lamp Switch Output
C	ORN	1054	Stop Lamp Switch	C	ORN	1054	Stop Lamp Switch
D	TAN	913	Park Lamp Feed	D	TAN	913	Park Lamp Feed
E	PPL	420	Brake Switch	E	PPL	420	Brake Switch
F	ORN	1040	12V Regulated	F	ORN	1040	12V Regulated
G	TAN	800	Serial Data Link 1	G	TAN	800	Serial Data Link 1
H	PNK	1020	Run 1	H	PNK	1020	Run 1
J	BLK	1704	Battery Life Tell Tale	J	BLK	1704	Battery Life Tell Tale
K	PPL	1807	Class 2 BUS	K	PPL	1807	Class 2 BUS
L	ORN	5620		L	ORN	5620	—
M	WHT	2027	Vehicle Wake Up	M	WHT	2027	Vehicle Wake Up
N	DK GRN/WHT	817	VSS 4K/Input	N	DK GRN/WHT	817	VSS 4K/Input
P	GRY	397	On	P	GRY	397	On
R	—	—	Not Used	R	—	—	Not Used
S	ORN	1040	12V Regulated	S	ORN	1040	12V Regulated
T	DK GRN/WHT	1135	BTSI Solenoid Feed	T	DK GRN/WHT	1135	BTSI Solenoid Feed
U	PPL	719	Sensor Return	U	PPL	719	Sensor Return
V	BLK	351	Ground	V	BLK	351	Ground
W	ORN	840	Battery	W	ORN	840	Battery

In-line Connector C300



Connector Part Information		**• 12160280 • 20 Way F Micro-Pack 100 W Sealed (Gray)**		**Connector Part Information**		**• 12160542 • 20 Way M Micro-Pack 100 W (Gray)**	
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A	TAN/BLK	800	Serial Data Link 1	A	TAN/BLK	800	Serial Data Link 1
B	TAN	800	Serial Data Link 2	B	TAN	800	Serial Data Link 2
C	PPL/WHT	1807	Class 2 BUS	C	PPL/WHT	1807	Class 2 BUS
D	LT GRN	275	Park Select	D	LT GRN	275	Park Select
E	ORN	940	Battery	E	ORN	940	Battery
F	BLK/WHT	451	PCM Ground	F	BLK/WHT	451	PCM Ground
G	YEL	492	Air Flow Sensor	G	YEL	492	Air Flow Sensor
H	RED/BLK	645	Air Flow Return	H	RED/BLK	645	Air Flow Return
J	—	—	Not Used	J	—	—	Not Used
K	—	—	Not Used	K	—	—	Not Used
L	WHT	5646	Charge Receptacle Temp 5V Ref	L	WHT	5646	Charge Receptacle Temp 5V Ref
M	DK BLU	660	Charge Receptacle Temp	M	DK BLU	660	Charge Receptacle Temp
N	—	—	Not Used	N	—	—	Not Used
P	—	—	Not Used	P	—	—	Not Used
R	PNK	1020	Run 1	R	PNK	1020	Run 1
S	WHT	2027	Vehicle Wake Up	S	WHT	2027	Vehicle Wake Up
T	RED/WHT	951	High Voltage Disconnect In	T	RED/WHT	951	High Voltage Disconnect In
U	RED	960	High Voltage Disconnect Out	U	RED	960	High Voltage Disconnect Out
V	BLK/WHT	931	High Voltage Disconnect	V	BLK/WHT	931	High Voltage Disconnect
W	YEL/BLK	915	Power Use	W	YEL/BLK	915	Power Use

In-line Connector C203

Drawing Not Available

Connector Part Information	• **12162463** • **116 Way F Micro-Pack 150, 280 Series (Black)**			**Connector Part Information**	• **15318195** • **116 Way M Micro-Pack 150, 280 Series (Black)**		
Pin	**Wire Color**	**Circuit No**	**Function**	**Pin**	**Wire Color**	**Circuit No**	**Function**
A1	—	—	Not Used	A1	—	—	Not Used
A2	—	—	Not Used	A2	—	—	Not Used
A3	—	—	Not Used	A3	—	—	Not Used
A4	—	—	Not Used	A4	—	—	Not Used
A5	YEL	116	Speaker Return LR	A5	YEL	116	Speaker Return LR
A6	BRN	199	Speaker Feed LR	A6	BRN	199	Speaker Feed LR
A7	LT BLU	115	Speaker Return RR	A7	LT BLU	115	Speaker Return RR
A8	DK BLU	46	Speaker Feed RR	A8	DK BLU	46	Speaker Feed RR
A9	—	—	Not Used	A9	—	—	Not Used
A10	GRY	605	5V Ref	A10	GRY	605	5V Ref
A11	WHT	606	Heated Mirror	A11	BLK/WHT	606	Heated Mirror
A12	GRY	910		A12	GRY	910	
A13	—	—	Not Used	A13	—	—	Not Used
B1	BRN	41	IGN 3	B1	BRN	41	IGN 3
B2	—	—	Not Used	B2	—	—	Not Used
B3	WHT/BLK	2029	Wait Indicator Lamp	B3	WHT/BLK	2029	Wait Indicator Lamp
B4	ORN	840	Battery	B4	ORN	840	Battery
B5	—	—	Not Used	B5	—	—	Not Used
B6	—	—	Not Used	B6	—	—	Not Used
B7	WHT	1390	IGN Off/Run/Crank	B7	WHT	1390	IGN Off/Run/Crank
B8	ORN	1740	Battery	B8	ORN	1740	Battery
B9	ORN	640	Battery	B9	ORN	640	Battery
B10	ORN	240	Battery	B10	ORN	240	Battery
B11	ORN	40	Battery	B11	ORN	40	Battery
B12	ORN	1040	12V Regulated	B12	ORN	1040	12V Regulated
B13	—	—	Not Used	B13	—	—	Not Used
C1	—	—	Not Used	C1	—	—	Not Used
C2	—	—	Not Used	C2	—	—	Not Used
C3	—	—	Not Used	C3	—	—	Not Used
C4	ORN	52	Blower High	C4	ORN	52	Blower High
C5	TAN	63	Blower Med 1	C5	TAN	63	Blower Med 1
C6	—	—	Not Used	C6	—	—	Not Used
C7	LT BLU	72	Blower Med 2	C7	LT BLU	72	Blower Med 2

Connector Part Information		**• 12162463 • 116 Way F Micro-Pack 150, 280 Series (Black)**		**Connector Part Information**		**• 15318195 • 116 Way M Micro-Pack 150, 280 Series (Black)**	
C8	LT BLU	203	Door Handle Switch	C8	LT BLU	203	Door Handle Switch
C9	—	—	Not Used	C9	—	—	Not Used
C10	—	—	Not Used	C10	—	—	Not Used
C11	—	—	Not Used	C11	—	—	Not Used
C12	—	—	Not Used	C12	—	—	Not Used
C13	—	—	Not Used	C13	—	—	Not Used
D1	—	—	Not Used	D1	—	—	Not Used
D2	—	—	Not Used	D2	—	—	Not Used
D3	—	—	Not Used	D3	—	—	Not Used
D4	—	—	Not Used	D4	—	—	Not Used
D5	LT BLU	733	Air Temp Valve Position Sensor	D5	LT BLU	733	Air Temp Valve Position Sensor
D6	—	—	Not Used	D6	—	—	Not Used
D7	—	—	Not Used	D7	—	—	Not Used
D8	—	—	Not Used	D8	—	—	Not Used
D9	—	—	Not Used	D9	—	—	Not Used
D10	—	—	Not Used	D10	—	—	Not Used
D11	—	—	Not Used	D11	—	—	Not Used
D12	—	—	Not Used	D12	—	—	Not Used
D13	—	—	Not Used	D13	—	—	Not Used
E1	ORN	1840	Battery	E1	ORN	1840	Battery
E2	DK GRN	389	VSS 4K	E2	DK GRN	389	VSS 4K
E11	—	—	Not Used	E11	—	—	Not Used
E12	WHT	352	Headlamp Relay	E12	WHT	352	Headlamp Relay
F1	PNK	3	IGN 1	F1	PNK	3	IGN 1
F2	YEL	143	Accessory	F2	YEL	143	Accessory
F11	BRN	64	High Speed Blower Relay	F11	BRN	64	High Speed Blower Relay
F12	BLK	1050	Ground	F12	BLK	1050	Ground
G1	PPL/WHT	1382	Dimming Disable	G1	PPL/WHT	1382	Dimming Disable
G2	—	—	Not Used	G2	GRY	1220	Dimming Pot
G11	—	—	Not Used	G11	ORN	54	Door Jamb Switch
G12	WHT	156	Courtesy Lamp	G12	WHT	156	Courtesy Lamp
H1	—	—	Not Used	H1	—	—	Not Used
H2	—	—	Not Used	H2	—	—	Not Used
H3	—	—	Not Used	H3	—	—	Not Used
H4	—	—	Not Used	H4	—	—	Not Used
H5	—	—	Not Used	H5	—	—	Not Used
H6	—	—	Not Used	H6	—	—	Not Used
H7	—	—	Not Used	H7	—	—	Not Used
H8	—	—	Not Used	H8	—	—	Not Used
H9	BRN	2409	Park Lamps	H9	BRN	2409	Park Lamps

CONNECTOR END VIEWS

Connector Part Information		• 12162463 • 116 Way F Micro-Pack 150, 280 Series (Black)	
H10	—	—	Not Used
H11	—	—	Not Used
H12	—	—	Not Used
H13	BLK/WHT	451	PCM Ground
J1	PNK	39	IGN 1
J2	PNK	139	IGN 1
J3	YEL	1139	IGN 1
J4	—	—	Not Used
J5	—	—	Not Used
J6	LT BLU/WHT	1414	LF Turn Signal
J7	DK BLU/WHT	1415	RF Turn Signal
J8	—	—	Not Used
J9	—	—	Not Used
J10	—	—	Not Used
J11	—	—	Not Used
J12	—	—	Not Used
J13	—	—	Not Used
K1	—	—	Not Used
K2	—	—	Not Used
K3	BRN	441	IGN 3
K4	PNK	1020	Run 1
K5	—	—	Not Used
K6	ORN	1732	Interior Lamp Request
K7	—	—	Not Used
K8	—	—	Not Used
K9	—	—	Not Used
K10	—	—	Not Used
K11	LT BLU	74	Park Lamp Switch
K12	PNK	353	IP Module Indicator Lamp
K13	TAN/BLK	371	IP Module Switch Pass
L1	—	—	Not Used
L2	TAN	1855	Service Soon Tell Tale
L3	—	—	Not Used
L4	ORN/BLK	1786	Transmission Park/Neutral Signal
L5	YEL	172	Low Fuel Indicator Lamp
L6	PPL	922	Transmission Range Indicator Switch Parity Bit Input

Connector Part Information		• 15318195 • 116 Way M Micro-Pack 150, 280 Series (Black)	
H10	—	—	Not Used
H11	—	—	Not Used
H12	—	—	Not Used
H13	BLK/WHT	451	PCM Ground
J1	PNK	39	IGN 1
J2	PNK	139	IGN 1
J3	YEL	1139	IGN 1
J4	—	—	Not Used
J5	—	—	Not Used
J6	LT BLU/WHT	1414	LF Turn Signal
J7	DK BLU/WHT	1415	RF Turn Signal
J8	—	—	Not Used
J9	—	—	Not Used
J10	—	—	Not Used
J11	—	—	Not Used
J12	—	—	Not Used
J13	—	—	Not Used
K1	—	—	Not Used
K2	—	—	Not Used
K3	BRN	441	IGN 3
K4	PNK	1020	Run 1
K5	—	—	Not Used
K6	ORN	1732	Interior Lamp Request
K7	—	—	Not Used
K8	—	—	Not Used
K9	—	—	Not Used
K10	—	—	Not Used
K11	LT BLU	74	Park Lamp Switch
K12	PNK	353	IP Module Indicator Lamp
K13	TAN/BLK	371	IP Module Switch Pass
L1	—	—	Not Used
L2	TAN	1855	Service Soon Tell Tale
L3	—	—	Not Used
L4	ORN/BLK	1786	Transmission Park/Neutral Signal
L5	YEL	172	Low Fuel Indicator Lamp
L6	PPL	922	Transmission Range Indicator Switch Parity Bit Input

Connector Part Information		• 12162463 • 116 Way F Micro-Pack 150, 280 Series (Black)		Connector Part Information		• 15318195 • 116 Way M Micro-Pack 150, 280 Series (Black)	
L7	GRY	1036	Class 2	L7	GRY	1036	Class 2
L8	BRN	358	SIR Indicator Lamp	L8	BRN	358	SIR Indicator Lamp
L9	—	—	Not Used	L9	—	—	Not Used
L10	—	—	Not Used	L10	—	—	Not Used
L11	—	—	Not Used	L11	—	—	Not Used
L12	—	—	Not Used	L12	—	—	Not Used
L13	—	—	Not Used	L13	—	—	Not Used

SECTION 8B

LIGHTING SYSTEMS

ON-VEHICLE SERVICE OF EXTERIOR LIGHTING

HEADLAMP REPLACEMENT

Composite Headlamps

↔ **Remove or Disconnect (Figures 1 through 4)**

CAUTION: Halogen bulbs contain a gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- **Turn the lamp switch OFF and the ignition switch to the LOCK position. Allow the bulb to cool before changing it. Leave the lamp switch OFF and the ignition switch in the LOCK position until the change is complete.**
- **Always wear eye protection when changing a halogen bulb.**
- **Handle the bulb only by its base. Avoid touching the glass.**
- **Do not drop or scratch the bulb. Keep moisture away.**
- **Place the used bulb in the new bulb's carton and dispose of it properly.**

1. Headlamp retainers.
2. Headlamp electrical connectors.
3. Headlamp from the vehicle.

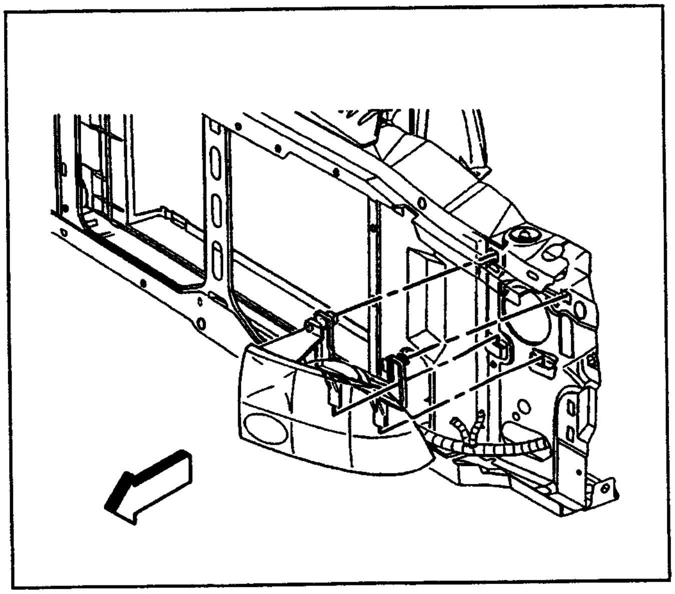


Figure 1—Composite Headlamp

→← **Install or Connect (Figures 1 through 4)**

NOTICE: *Avoid touching the bulb or letting it come in contact with anything damp. Oil from your skin or moisture on the bulb can cause the bulb to explode when it is turned on. If either comes in contact with the bulb, clean it with alcohol or a suitable degreaser and wipe the bulb dry.*

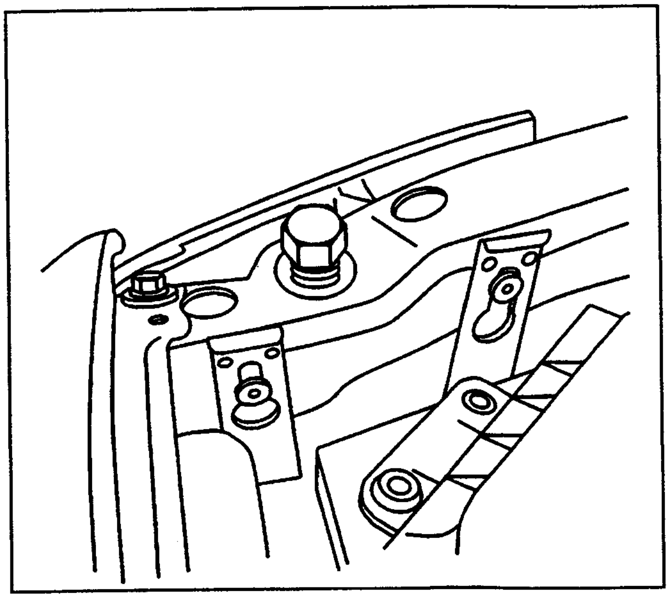


Figure 2—Composite Headlamp Retainers

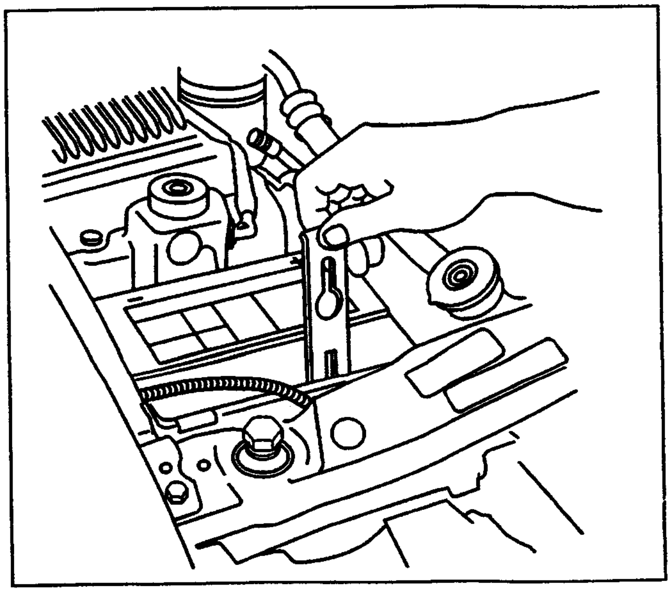


Figure 3—Removing the Headlamp Retainers

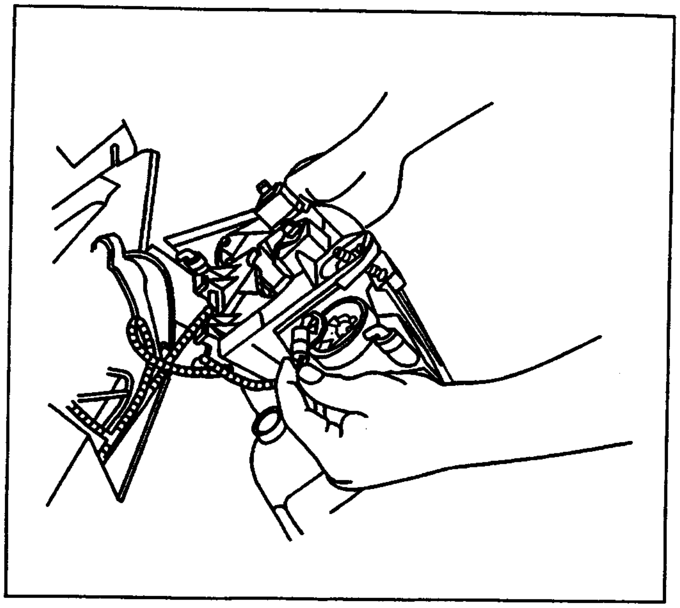


Figure 4—Composite Headlamp Electrical Connectors

1. Headlamp electrical connectors.
2. Headlamp to the vehicle.
3. Headlamp retainers.

HEADLAMP BULB REPLACEMENT

CAUTION: Halogen bulbs contain a gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- **Turn the lamp switch OFF and the ignition switch to the LOCK position. Allow the bulb to cool before changing it. Leave the lamp switch OFF and the ignition switch in the LOCK position until the change is complete.**
- **Always wear eye protection when changing a halogen bulb.**
- **Handle the bulb only by its base. Avoid touching the glass.**
- **Do not drop or scratch the bulb. Keep moisture away.**
- **Place the used bulb in the new bulb's carton and dispose of it properly.**

Remove or Disconnect

1. Headlamp from vehicle. Refer to Headlamp Replacement in this section.
2. Bulb from the headlamp by pushing in and rotating it 1/4 turn counter-clockwise.

Install or Connect

1. Bulb to the headlamp by pushing in and rotating it 1/4 turn clockwise.
2. Headlamp to vehicle.

HEADLAMP ADJUSTMENT

Composite Headlamps

Horizontal and vertical aiming adjustments are made by turning the adjustment screws, which can be accessed through the top of the radiator grille with the hood raised. The vertical adjustment screw is located on the outboard side of the headlamp. The aim of the headlamp is raised by turning the vertical adjustment screw clockwise, and lowered by turning the screw counter-clockwise. The horizontal adjustment screw is located on the inboard side of the headlamp. Turning the horizontal adjustment screw clockwise moves the aim of the headlamp inboard, and turning the screw counter-clockwise moves the aim outboard.

Adjustment Procedure

Some state and local authorities have specific requirements for aiming headlamps. These requirements must be followed. Replacement of a headlamp will not normally require an aiming adjustment. However, the alignment should be checked.

Use the headlight aimer, tool J 25300-E or equivalent. Instructions for using the headlight aimer are supplied by the tool manufacturer.

If no special tools are available, the screen method may be used. To use the screen method, it is desirable to have a specific aiming area in a darkened location. The area should be large enough to accommodate the vehicle, plus an additional 7.62 m (25 feet), as measured from the front surface of the headlamp to the surface of the screen. The floor on which the vehicle rests must be level with the bottom of the screen. If the floor is not level, compensate as necessary.

The aiming screen should be at least 1.52 m (5 feet) high by 3.66 m (12 feet) wide with a matte white surface, well shaded from extraneous light, and properly adjusted in relation to the floor. The screen must have a vertical centerline, two laterally adjustable vertical tape lines, and a vertically adjustable horizontal tape line. If a regular commercial aiming screen is not available, the screen may consist of a vertical wall having an uninterrupted area approximately 1.52 m (5 feet) high by 3.66 m (12 feet) wide, finished with a washable flat white paint.

Important

- For each vehicle checked, the horizontal tape line on the screen must be adjusted. Vehicles of the same model and year may have different heights for the headlamps.
- Provisions should be made for moving the screen, so that it can be aligned parallel with the rear axle.
- Once the screen has been set up in a permanent location, a reference line should be painted on the floor to mark the proper location of the headlamps when they are being aimed.

To aim the headlamps using the screen method:

1. Position the vehicle squarely with the screen, so that the front surfaces of the headlamps are 7.62 m (25 feet) from the aiming screen.
2. Make sure that all vehicle components are properly installed, if other work has been performed on the vehicle. Stop all other work on the vehicle.
3. Make sure the vehicle has 1/3 tank of fuel or less.

4. Close all of the vehicle's doors.
5. Rock the vehicle to stabilize the suspension.
6. Align the centerline of the vehicle with the vertical centerline on the screen. This can be done by marking the center of the top edge of the front and rear windows with tape. Use these lines as "sights" to align the vertical centerlines of the vehicle with the screen.
7. Adjust the distance between the vertical center line and the vertical tape lines on the aiming screen to correspond with the distance between the vehicle's vertical centerline and the vertical centerline of the low beam headlamps.
8. Adjust the height of the horizontal tape line on the aiming screen to match the distance between the floor and the horizontal centerline of the low beam headlamps.
9. Turn on the low beam headlamps and observe the left and top edges of the high intensity zones on the aiming screen.

Adjust

- The top edge of each high intensity zone must be within 75 mm (3 inches) above to 38 mm (1.5 inches) below the horizontal centerline.
- The left edge of each high intensity zone must be within 100 mm (4 inches) either side of the vertical centerlines.

FRONT TURN SIGNAL LAMP BULB REPLACEMENT

Remove or Disconnect (Figures 1 through 4)

- Make sure the headlamp switch is in the OFF position.
- Make sure the ignition switch is in the OFF position.

1. Headlamp retainers.
2. Headlamp from the vehicle.
3. Bulb and socket from headlamp.
4. Bulb from the socket.

Install or Connect (Figures 1 through 4)

1. Bulb to the socket.
2. Bulb and socket to the headlamp.
3. Headlamp to the vehicle.
4. Headlamp retainers.

Fog Lamp Bulb Replacement

CENTER HIGH-MOUNTED STOP LAMP (CHMSL) REPLACEMENT

Pickup

Remove or Disconnect (Figure 7)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Dome lamp lens by squeezing lens to release tabs.
3. Dome lamp bulb.
4. Screws that retain the dome lamp base to the CHMSL from inside the vehicle.
5. Dome lamp base from the vehicle.
6. Dome lamp/CHMSL electrical connector.
7. CHMSL from the vehicle.

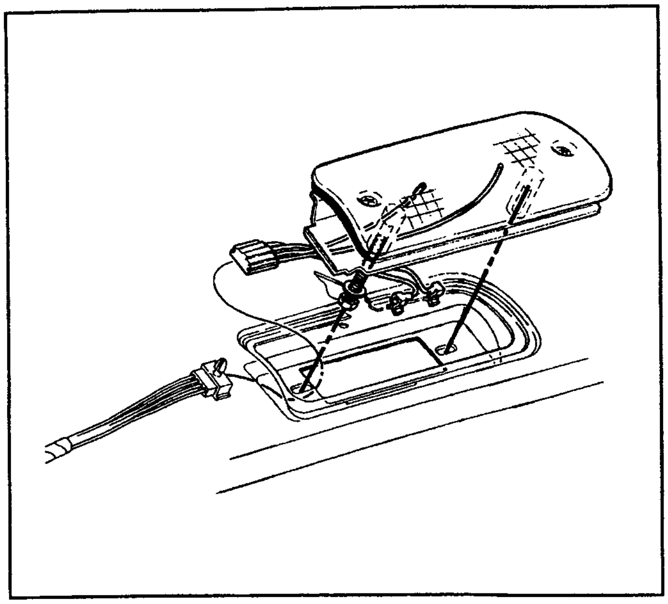


Figure 7—CHMSL

Install or Connect (Figure 7)

1. CHMSL to the vehicle.
2. Dome lamp/CHMSL electrical connector.
3. Dome lamp base to the vehicle.
4. Screws that retain the dome lamp base to the CHMSL from inside the vehicle.

Tighten

- Screws to 2.5 N.m (22 lb in).

5. Dome lamp bulb.
6. Dome lamp lens by squeezing lens to engage tabs.
7. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

CHMSL BULB REPLACEMENT

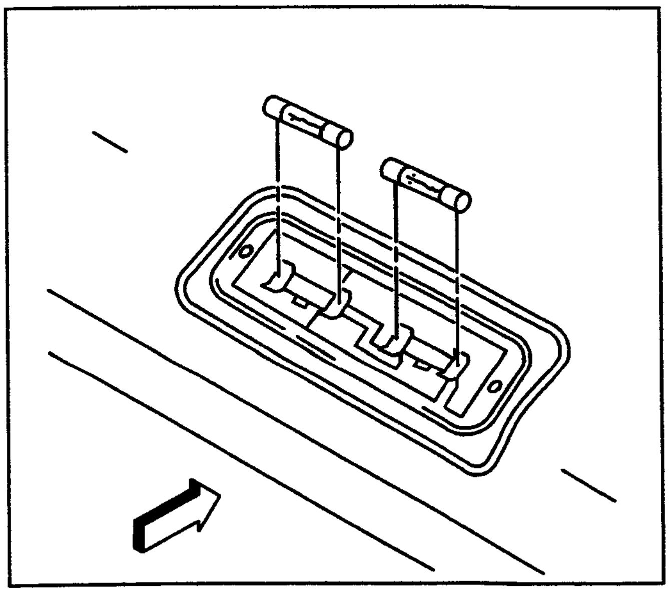


Figure 10—CHMSL Bulbs

Remove or Disconnect (Figure 10)

1. Screws that retain the CHMSL lens to the vehicle.
2. CHMSL lens from the vehicle.
3. CHMSL bulb(s).

Install or Connect (Figure 10)

1. CHMSL bulb(s).
2. CHMSL lens to the vehicle. Make sure that the CHMSL lens gasket is properly seated.
3. Screws that retain the CHMSL lens to the vehicle.

Tighten

- CHMSL lens screws to 2.5 N·m (22 lb in).

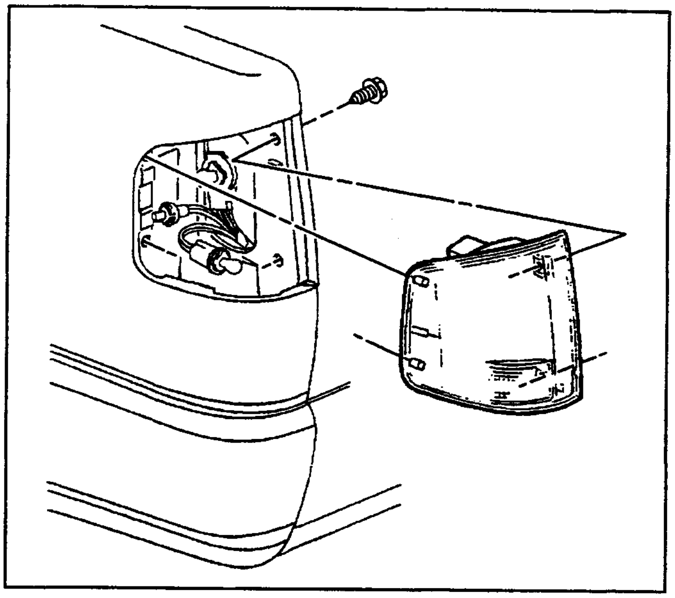


Figure 11—Tail Lamp (Pickup)

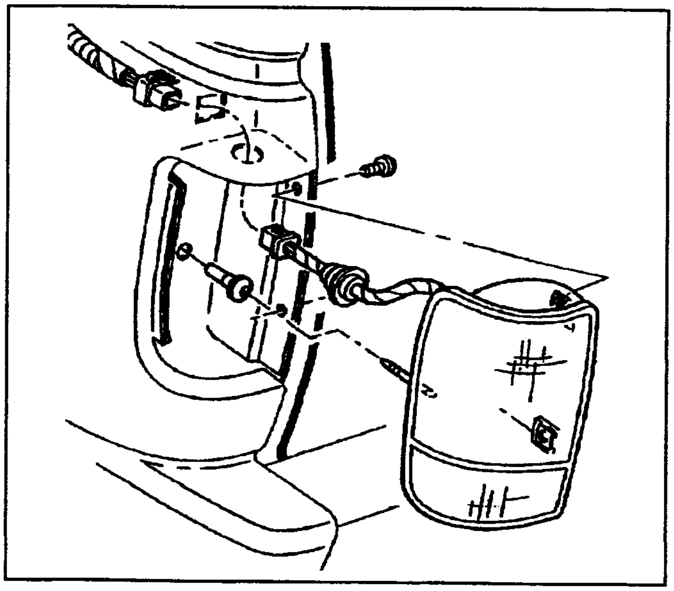


Figure 12—Tail Lamp (Utility)

TAIL LAMP AND BULB REPLACEMENT

Remove or Disconnect (Figures 11 and 12)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Open the endgate or liftgate.
3. Screws that retain the tail lamp assembly to the vehicle.
4. Tail lamp assembly from the vehicle.
5. Bulb sockets from the tail lamp assembly by rotating them 1/4 turn counter-clockwise.
6. Bulb(s) from the socket(s).

Install or Connect (Figures 11 and 12)

1. Bulb(s) to the socket(s).
2. Bulb sockets to the tail lamp assembly by rotating them 1/4 turn clockwise.
3. Tail lamp assembly to the vehicle.
4. Screws that retain the tail lamp assembly to the vehicle.

Tighten

- Screws to 1.9 N·m (17 lb in).

5. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

LICENSE PLATE LAMP AND BULB REPLACEMENT

Pickup (With Step Bumper)

Remove or Disconnect (Figures 13 and 14)

Important

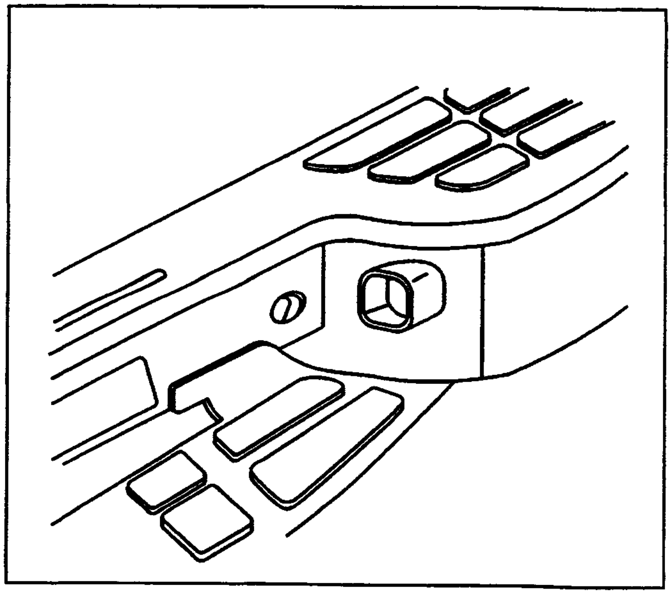


Figure 13—License Plate Lamp (Pickup with Step Bumper)

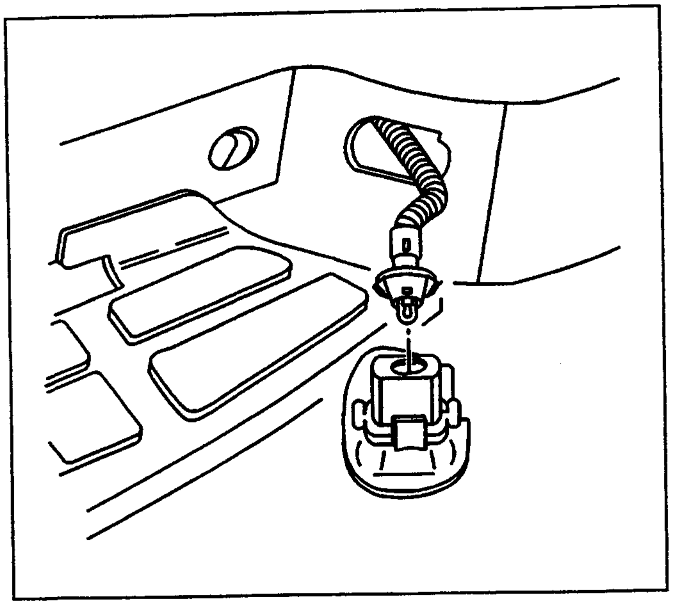


Figure 14—Removing Bulb and Socket from License Plate Lamp Assembly

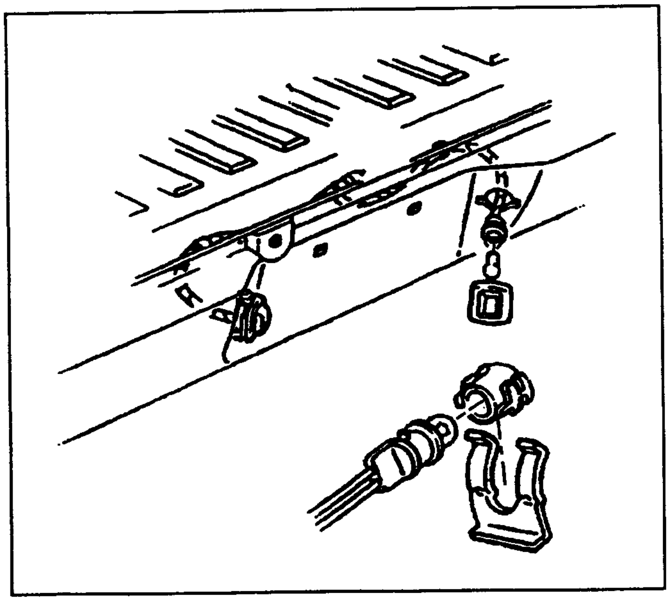


Figure 15—License Plate Lamp (Pickup without Step Bumper)

Make sure the headlamp switch is in the OFF position and the ignition switch is in the LOCK position.

1. Bulb socket from the license plate lamp assembly by rotating it 1/4 turn counter-clockwise.
2. Bulb from the socket.
3. License plate lamp from the bumper.

Install or Connect (Figures 13 and 14)

1. License plate lamp to the bumper.
2. Bulb to the socket.
3. Bulb socket to the license plate lamp assembly by inserting and rotating 1/4 turn clockwise.

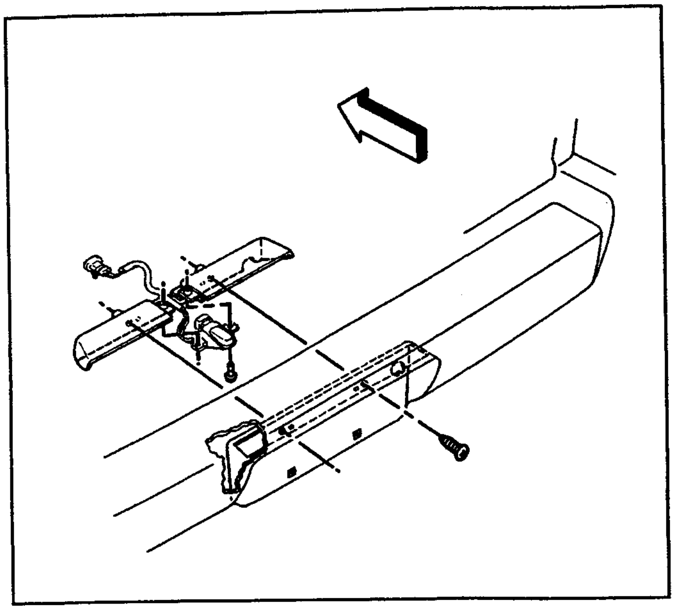


Figure 16—License Plate Lamp and Bracket (Utility and Sportside Pickup)

UNDERHOOD LAMP REPLACEMENT

Remove or Disconnect (Figure 17)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions sand Notices.
2. Electrical connector.
3. Screw, star washer, and ground wire from the hood.
4. Screws that retain the underhood lamp to the hood.
5. Underhood lamp assembly from the vehicle.

Install or Connect (Figure 17)

1. Underhood lamp assembly to the vehicle.
2. Screws that retain the underhood lamp to the hood.

   Tighten

   - Screws to 1.9 N·m (17 lb in).
3. Ground wire, star washer, and screw to the hood.

   Tighten

   - Screw to 1.9 N·m (17 lb in).
4. Electrical connector.
5. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

HORN REPLACEMENT

Left Side

Remove or Disconnect (Figure 18)

1. Windshield washer solvent container. Refer to Washer Solvent Container and Pump Replacement in Windshield Wiper/Washer System.
2. Electrical connector.

3. Bolt that retains the horn assembly to the fender.
4. Horn assembly from the fender.

Install or Connect (Figure 18)

1. Horn assembly to the fender.
2. Bolt that retains the horn assembly to the fender.

   Tighten

   - Bolt to 17 N.m (13 lb ft).
3. Electrical connector.
4. Windshield washer solvent container. Refer to Washer Solvent Container and Pump Replacement in Windshield Wiper/Washer System.

Right Side

Remove or Disconnect

1. Electrical connector.
2. Bolt that retains the horn assembly to the fender.
3. Horn assembly from the fender.

Install or Connect

1. Horn assembly-to-fender.
2. Bolt that retains the horn assembly to the fender.

   Tighten

   - Bolt to 17 N.m (13 lb ft).
3. Electrical connector.

HORN RELAY REPLACEMENT

Remove or Disconnect

1. Open the hood.
2. Remove protective cover from underhood bussed electrical center.
3. Horn relay from the underhood bussed electrical center. Refer to Electrical Diagnosis Cell 10.

Install or Connect

1. Horn relay to the underhood bussed electrical center.
2. Protective cover to underhood bussed electrical center.

HORN CURRENT ADJUSTMENT

Turn the adjustment screw clockwise to increase current or counter-clockwise to decrease current until the specified current is reached. Care must be taken not to turn the adjustment screw too far. Turn the screw 90 degrees at a time. If adjustment loosens the screw excessively, it may be staked with a punch.

Cold Weather Adjustment

If the horns fails to operate in cold weather, it is possible that the current limit is set too low, although still within the 4.5 to 5.5 ampere limit for each horn at 12.0 volts.

NOTICE: ***This adjustment should not be made unless the horns fail to operate. A current increase on a properly operating horn can result in complete malfunction of the horn.***

Adjust

1. To increase current, rotate the adjustment screw in the clockwise direction.
2. To decrease current, rotate the adjustment screw in the counter-clockwise direction. Current limit is 4.5 amperes at 12.0 volts.
3. Adjustments should be made at 90 degree intervals.

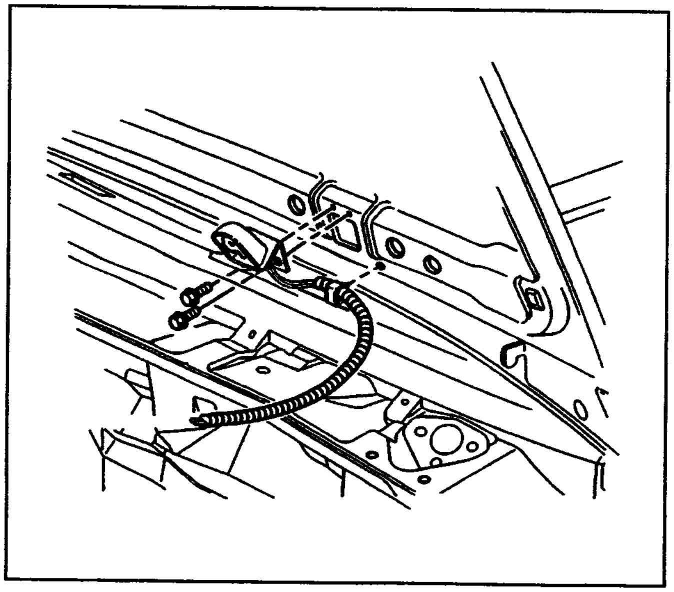


Figure 17—Underhood Lamp

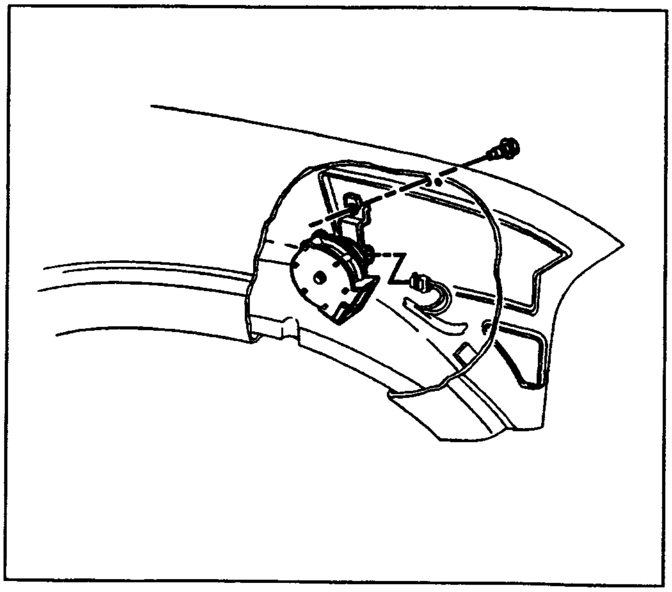


Figure 18—Horn Assembly

ON-VEHICLE SERVICE OF INTERIOR LIGHTING AND SWITCHES

ASH TRAY LAMP REPLACEMENT

Remove or Disconnect (Figures 19 and 20)

1. Negative battery cable. Refer to Battery Cable Disconnect Caution in Cautions and Notices.
2. Ash tray.
3. Knee bolster. Refer to Knee Bolster Replacement in Interior Trim.
4. Screws that retain the ash tray housing to the instrument panel.
5. Slide the ash tray housing forward.
6. Bulb from the ash tray housing.

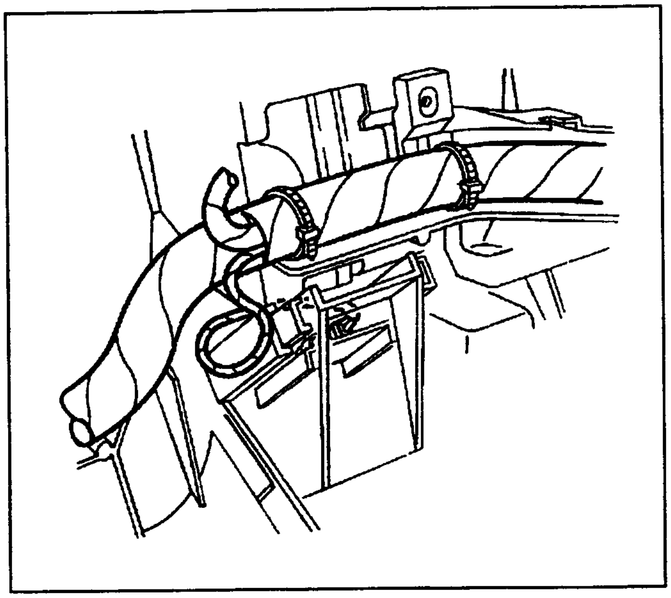


Figure 19—Ash Tray Lamp Mounting

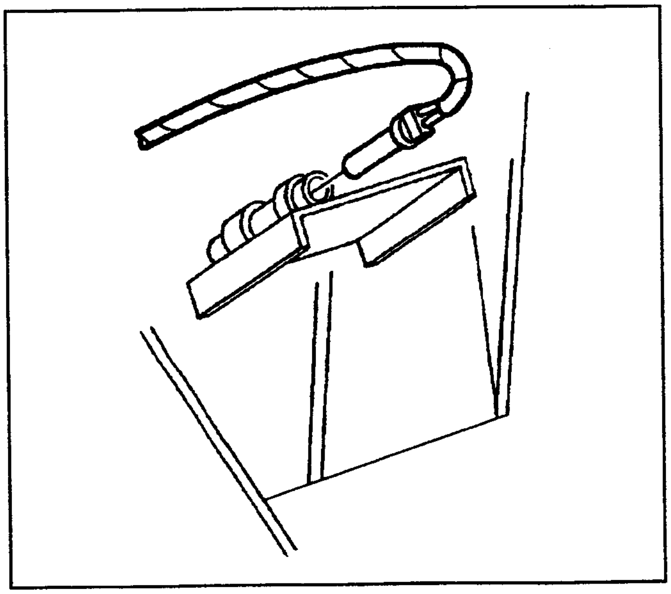


Figure 20—Ash Tray Lamp

   A. Squeeze the metal tangs on the bulb shield and lift.
   B. Lift the bulb from the socket.

Install or Connect (Figures 19 and 20)

1. Bulb to the ash tray housing.
   A. Insert the bulb into the socket.
   B. Squeeze the tangs on the bulb shield and push it back into the housing.
2. Slide the ash tray housing back into the instrument panel.
3. Screws that retain the ash tray housing to the instrument panel.

Tighten

- Screws to 1.9 N.m (17 lb in).

4. Knee bolster. Refer to Knee Bolster Replacement in Interior Trim.
5. Ash tray.
6. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

DAYTIME RUNNING LAMPS (DRL) DIODE REPLACEMENT

Remove or Disconnect

Important

Make sure the headlamp switch is in the OFF position and the ignition switch is in the LOCK position.

1. Open hood.
2. Remove protective cover from underhood bussed electrical center.
3. Remove diode. Refer to Electrical Diagnosis Cell 10.

Install or Connect

1. Insert the diode.
2. Protective cover-to-underhood bussed electrical center.

DAYTIME RUNNING LAMPS (DRL) RELAY REPLACEMENT

Remove or Disconnect

1. Open the hood.
2. Remove protective cover from underhood bussed electrical center.
3. DRL relay from the junction block. Refer to Electrical Diagnosis Cell 10.

Install or Connect

1. DRL relay to the junction block.
2. Protective cover to underhood bussed electrical center.

DOME LAMP AND BULB REPLACEMENT

On pickup models, the dome lamp is located on the roof panel above the rear glass. On utility vehicles, two different lamps are used. One type of dome lamp is incorporated to the overhead console. On utility vehicles without an overhead console, a separate unit is used.

Pickup

Remove or Disconnect (Figure 21)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Dome lamp lens by squeezing lens to release tabs.
3. Dome lamp bulb.
4. Screws that retain the dome lamp base to the CHMSL from inside the vehicle.
5. Dome lamp base from the vehicle.

Install or Connect (Figure 21)

1. Dome lamp base to the vehicle.
2. Screws that retain the dome lamp base to the CHMSL from inside the vehicle.

   Tighten

   - Screws to 2.5 N·m (22 lb in).

3. Dome lamp bulb.
4. Dome lamp lens by squeezing lens to engage tabs.
5. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

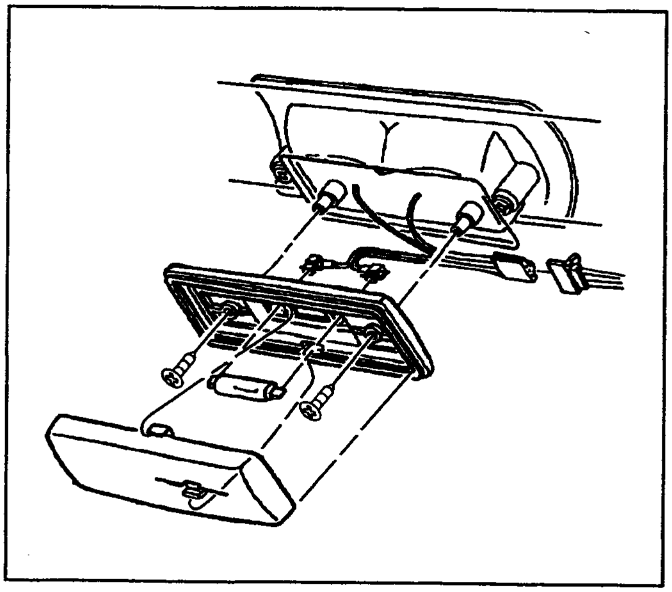


Figure 21—Dome Lamp Components

DOOR JAMB SWITCH REPLACEMENT

Front Doors

Remove or Disconnect (Figures 25 and 26)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Instrument panel sound insulator (right side only). Refer to Instrument Panel Sound Insulator Replacement in Interior Trim.
3. Reach up and disconnect the electrical connector.
4. Door jamb switch from the vehicle. Squeeze the locking tabs to release the switch.

Install or Connect (Figures 25 and 26)

1. Door jamb switch to the vehicle. Fully seat the locking tabs.
2. Electrical connector to the switch.

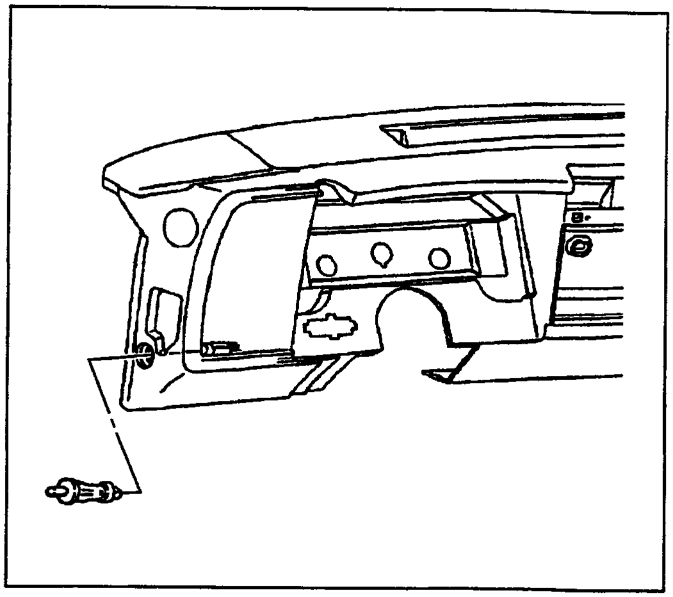


Figure 25—Front Door Jamb Switch (Left Side)

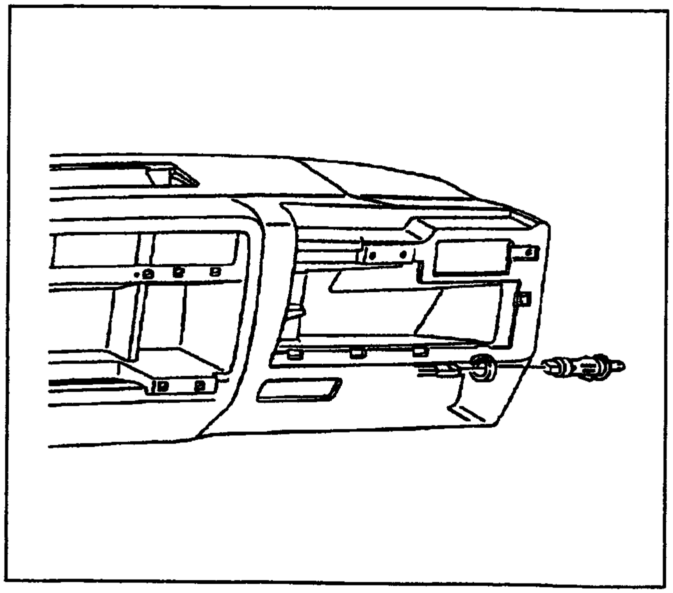


Figure 26—Front Door Jamb Switch (Right Side)

3. Instrument panel sound insulator. (Right side only). Refer to Instrument Panel Sound Insulator Replacement in Interior Trim.
4. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

HEADLAMP DIMMER SWITCH REPLACEMENT

The headlamp dimmer switch is part of the multifunction switch, and is not serviced separately. Refer to Multifunction Switch Replacement in Steering Wheel and Column On-Vehicle Service for service information on the multifunction switch.

HEADLAMP SWITCH REPLACEMENT

Remove or Disconnect (Figure 31)

Important

Make sure the headlamp switch is in the OFF position and the ignition switch is in the LOCK position.

1. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.
2. Electrical connector.
3. Screws that retain the headlamp switch panel to the instrument panel accessory trim plate.
4. Headlamp switch panel from the instrument panel accessory trim plate.
5. Headlamp switch from the headlamp switch panel.

Install or Connect (Figure 31)

1. Headlamp switch to the headlamp switch panel.
2. Headlamp switch panel to the instrument panel accessory trim plate.
3. Screws that retain the headlamp switch panel to the instrument cluster bezel.

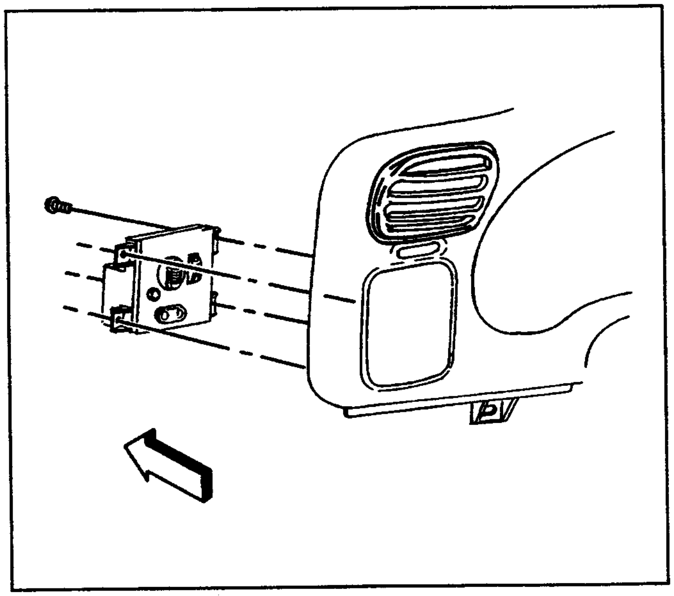


Figure 31—Headlamp and Interior Lights Dimmer Switch

Tighten

- Screws to 1 N·m (9 lb in).

4. Electrical connector.
5. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.

INTERIOR LIGHTS DIMMER SWITCH REPLACEMENT

Remove or Disconnect (Figure 31)

Important

Make sure the headlamp switch is in the OFF position and the ignition switch is in the LOCK position.

1. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.
2. Electrical connector.
3. Screws that retain the headlamp switch panel to the instrument panel accessory trim plate.
4. Headlamp switch panel from the instrument panel accessory trim plate.
5. Instrument panel dimmer switch from the headlamp switch panel.

Install or Connect (Figure 31)

1. Instrument panel dimmer switch to the headlamp switch panel.
2. Headlamp switch panel to the instrument panel accessory trim plate.
3. Screws that retain the headlamp switch panel to the instrument cluster bezel.

Tighten

- Screws to 1 N·m (9 lb in).

4. Electrical connector.
5. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.

INSTRUMENT PANEL STORAGE COMPARTMENT SWITCH AND BULB REPLACEMENT

Remove or Disconnect (Figure 32)

1. Instrument panel storage compartment bezel. Refer to Instrument Panel Storage Compartment Door and Bezel Replacement in Interior Trim.
2. Electrical connector from the lamp and switch assembly.
3. Lamp and switch assembly from the instrument panel storage compartment bezel. Release the lock tabs and push the lamp and switch assembly out.
4. Bulb from the lamp and switch assembly.

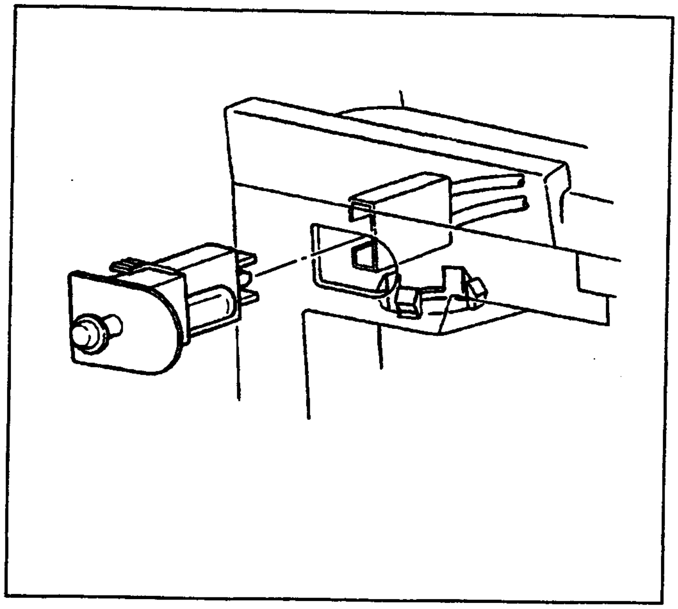


Figure 32—Instrument Panel Storage Compartment Lamp and Switch

Install or Connect (Figure 32)

1. Bulb to the lamp and switch assembly.
2. Lamp and switch assembly.
3. Electrical connector to the lamp and switch assembly.
4. Instrument panel storage compartment bezel. Refer to Instrument Panel Storage Compartment Door and Bezel Replacement in Interior Trim.

SPECIFICATIONS

LAMP AND BULB DATA

Exterior Lamps	Quantity	Trade No.
Sealed Beam Headlamps	2	2E1
Low Beam Headlamps (Composite)	2	9006HB4
High Beam Headlamps (Composite)	2	9005HB3
Side Marker Lamps	2	194
Front Turn Signal Lamps	2	3157
CHMSL Lamps (Pickup)	2	2112
Backup Lamps	2	3057
Tail and Stop Lamps	2 or 4	3057
License Plate Lamps	1 or 2	194

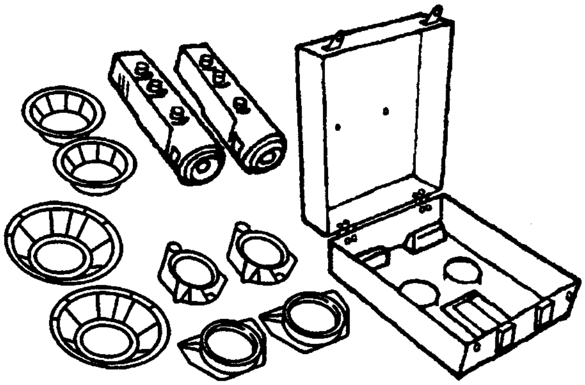
Interior Lamps	Quantity	Trade No.
Dome Lamp	1	2112
Courtesy Lamps	2	906
Ash Tray Lamp	1	161
Instrument Panel Storage Compartment Lamp	1	194
Heater and A/C Control Lamps	2	37
Underhood Lamp	1	93

Instrument Cluster Lamps	Quantity	Trade No.
Instrument Cluster Illumination	6	PC168
High Beam Indicator	1	PC74
Turn Signal Indicator	2	PC74

FASTENER TIGHTENING SPECIFICATIONS

Application	N·m	Lb ft	Lb in
Headlamp Retaining Pins	7	—	62
Side Marker Lamp Screws	1.5	—	13
Front Turn Signal Lamp Screws	1.5	—	13
Dome Lamp to CHMSL Screws	2.5	—	22
CHMSL Lens Screws (Pickup)	2.5	—	22
Tail Lamp Screws	1.9	—	17
Underhood Lamp Screws	1.9	—	17
Horn Bolts	17	13	—
Ash Tray Housing Screws	1.9	—	17
Headlamp Switch Panel Screws	1	—	9

SPECIAL TOOLS



1. J 25300–13 Safety Aimer

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SECTION 8C

INSTRUMENT PANEL AND GAUGES

GENERAL DESCRIPTION

INSTRUMENT PANEL AND GAUGES

The instrument panel is designed to allow the removal of all control switches from the driver side. The standard instrument cluster is equipped with analog gauges that show power use, vehicle speed, battery state of charge, and battery voltage. The instrument cluster also contains indicator lamps to alert the operator of the vehicle to possible system malfunctions, system operating conditions, and safety belt use.

> **NOTICE:** ***When replacing a speedometer or odometer assembly, federal law requires that the odometer reading of the replacement unit be set to register the same mileage as the prior odometer. If the same mileage cannot be set, the law requires that the replacement odometer be set at zero and a label be installed on the driver's door frame to show the previous odometer reading and the date of replacement.***

POWER USE GAUGE

The power use gauge shows the current level of power that is being used by the vehicle. The gauge will move to the right when power is being taken from the battery pack, and move to the left when power is being put back into the battery pack. For diagnostic information refer to Electrical.

ELECTRIC SPEEDOMETER

An electric speedometer drive is standard equipment on all S/T models. Integrated circuits control the air core speedometer and stepper motor odometer. Lighting is provided by removable bulb and socket assemblies that insert into the back of the instrument cluster.

The speedometer system consists of the instrument cluster, drive motor speed and direction sensor, PIM and related wiring.

The one-piece instrument cluster mounts in front of the driver in the instrument panel. It is not serviceable. If diagnosis leads to a malfunctioning instrument cluster, it must be replaced. Repairs to the instrument cluster can only be performed by an authorized instrument cluster service center.

The PIM converts the analog output from the vehicle speed sensor to a digital signal containing 4000 Pulses Per Mile (PPM) for the instrument cluster. The PIM is matched to the final drive and tire size of each vehicle. If the final drive or tire size is changed for any reason, the PIM must be updated to match the new final drive or tire size. If not, the signal will not be accurate for proper speedometer/odometer operation. An incorrect signal can affect antilock brakes and cruise control systems.

BATTERY STATE OF CHARGE GAUGE

The battery state of charge gauge indicates the level of the charge left in the battery. For diagnostic information refer to Electrical.

> **NOTICE:** ***Driving the vehicle with the charge level below "E" may reduce the life of your battery pack.***

VOLTMETER

The voltmeter shows the battery pack's state of charge. The reading displayed is in DC volts. The Battery Pack Module generates a pulse-width modulated signal which varying 0-100 percent duty cycle. The signal is sent to the vehicle interface module which converts the signal to analog. The signal is then registered on the voltmeter. The voltmeter will display the battery pack's state of charge at all times. regardless of key position. For diagnostic information refer to Electrical.

ELECTRONIC PRND

Electric vehicles have an electronic Park Reverse Neutral Drive, (PRND) range indicator. A signal is sent from the transmission range indicator switch mounted on the drive unit to the Power Invertor Module (PIM). The PIM converts this signal to a serial data signal and sends it to the Battery Pack Control Module (BPCM). The BPCM sends a serial data signal to the Instrument Panel Cluster, then illuminates the selected gear range. For diagnostic information refer to Electrical.

AIR BAG LAMP

This lamp will come on when the key is turned to the RUN position for a three-second bulb check. The lamp should then go out. This indicates that the system is ready. If the air bag indicator lamp stays on after the bulb check or comes on while driving, the air bag system may not work properly. Refer to Supplemental Inflatable Restraints.

BATTERY LIFE INDICATOR LAMP

This lamp will come on when battery pack power is low. The battery pack should be charged as soon as possible. The lamp will go off when the battery pack is recharged. If the lamp remains on, refer to Battery Pack Controls.

SERVICE NOW LAMP

This lamp will illuminate for a three-second bulb check when the key is turned to the RUN position. If it does not illuminate, or stays illuminated, or illuminates while driving, a problem exists within the propulsion system, battery pack, or cooling system. Battery Pack Controls.

BRAKE SYSTEM WARNING LAMP

The brake warning system consists of two lamps in the instrument cluster: the brake warning lamp and the antilock indicator lamp.

The brake warning lamp indicates a low fluid pressure condition exists in the brake system when it finds ground through the pressure differential switch in the combination valve. It also indicates the parking brake is applied when it finds ground through the parking brake switch. For additional information on the brake warning lamp operation, refer to Hydraulic Brakes.

ANTILOCK BRAKE SYSTEM WARNING LAMP

The ANTILOCK lamp serves as an indication of four wheel antilock system operation and malfunctions. A bulb check is done each time the key is turned to the RUN position. The lamp should illuminate and remain on for about three-seconds. If the lamp stays illuminated or illuminates while driving the antilock brake system way need service. If the brake system warning lamp is not illuminated, you still have brakes, but the antilock system may not operate. To determine the specific cause of a system malfunction, refer to Four Wheel Antilock Brakes.

WAIT INDICATOR LAMP

The wait indicator lamp illuminates when the automatic disconnect device is resetting itself. While this lamp is illuminated you will not be able to drive or charge the vehicle. If this lamp remains illuminated for more than one minute, check that the high-voltage disconnect is properly installed.

TEMPERATURE INDICATOR LAMP

This lamp will illuminate for a three-second bulb check when the key is turned to the RUN position. If this lamp does not illuminate, or remains illuminated, or illuminates while driving, a problem exists within some part of the propulsion system, battery pack, or cooling system. A temporary loss of air conditioning may occur when this lamp is illuminated.

TURN SIGNAL INDICATOR LAMP

An arrow on the instrument panel will flash in the direction of the turn or lane change.

HEADLAMP HIGH/LOW BEAM INDICATOR LAMP

This indicator lamp is illuminated when the high-beam headlamps are on.

SERVICE SOON INDICATOR LAMP

This lamp will illuminate for a three-second bulb check when the key is turned to the RUN position. If this lamp does not illuminate, or remains illuminated, or illuminates while driving, a problem exists within some part of the propulsion system, battery pack, or cooling system.

Driving the vehicle while this is lamp is illuminated may reduce the range and the drive system performance may be affected.

CHARGE PADDLE CONNECTION INDICATOR LAMP

This lamp comes on whenever the vehicle is in the RUN mode and a charge paddle is inserted into the charge receptacle. You will not be able to shift out of PARK (P) with the charge paddle in the charge receptacle. When the charge paddle is removed, the lamp should go off. The lamp will also illuminate when the key is in the unlock position.

LOW HEATER FUEL INDICATOR LAMP

This lamp will illuminate for a three-second bulb check when the key is turned to the RUN position. The lamp will illuminate when the fuel-fired heater fuel tank is low on fuel.

To turn the lamp off, add diesel fuel to the fuel-fired heater fuel tank through the fuel filler port on the driver's side of the vehicle. If the lamp does not go off after adding fuel, it may indicate that your fuel-fired heater is not working properly. Refer to Heater, Ventilation, and Air Conditioning.

SEAT BELT WARNING SYSTEM

The electric vehicles have an enhanced seat belt warning system. This system activates a warning lamp for about 75 seconds and a buzzer for about 8 seconds when the ignition switch is turned to the RUN position and the driver's seat belt is not buckled. The warning lamp will be constant for the first 20 seconds, then flash for the remaining 55 seconds. The buzzer only turns on, and will stay on when the driver's seat belt is not fastened during the 8-second time period. The warning lamp and buzzer sequence of operation is as follows:

1. DRIVER'S SEAT BELT UNBUCKLED—Turn the ignition switch to the RUN position. The warning lamp illuminates constantly for 20 seconds, then flashes for the remaining 55 seconds. The buzzer turns on and stays on for 8 seconds, then turns off. If the driver's seat belt buckle is buckled before the 8 seconds is over, the buzzer will turn off and the lamp will remain on for the balance of the time delay.
2. DRIVER'S SEAT BELT BUCKLED—Turn the ignition switch to the RUN position. The warning lamp will turn on and the buzzer stays off. At the end of 75 seconds the warning lamp turns off. If the driver's seat belt buckle is unbuckled prior to 8 seconds, the buzzer will turn on for the balance of the 8-second delay.

INSTRUMENT PANEL HARNESSES

The instrument panel harness starts at the front of dash harness, then runs along the length of the instrument panel to the fuse block, servicing various components such as the HVAC, radio, instrument cluster and lamping switches. The harness attaches to the pad assembly with enable clips and retainers. Diagnosis of the instrument panel harness is covered in the electrical diagrams and diagnosis section of GMT/97-ST-2. The fuse block is located at the far left side of the instrument panel behind a removable cover. It utilizes miniature blade-style fuses. Refer to the block details in Electrical Fuse Block Details of the GMT/97-ST-2, for a listing of fuses and the circuits they protect.

ON-VEHICLE SERVICE

HANDLING ELECTROSTATIC DISCHARGE (ESD) SENSITIVE PARTS

Many solid state electrical components can be damaged by Electrostatic Discharge (ESD). Some will display a label but many will not (Figure 1).

NOTICE: ***To avoid possibly damaging any components, observe the following:***

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
   - Slide across the vehicle seat.
   - Sit down or get up.
   - Do any walking.
2. Do not touch exposed terminals on components with your finger or any tools. Remember, the connector you are checking might be tied into a circuit that could be damaged by electrostatic discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or between the exposed terminals.
4. Never jump, ground, or use test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install it.
6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if:
   - They are bumped or dropped.
   - They are laid on any metal work bench or near any components that operate electrically, such as a TV, radio, or oscilloscope.

INSTRUMENT PANEL REPLACEMENT

↔ **Remove or Disconnect (Figures 2 through 4)**

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Right instrument panel sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
3. Instrument panel storage compartment. Refer to Instrument Panel Storage Compartment Replacement in this section.
4. Disable passenger SIR System connector. Refer to Disabling the SIR System in Restraints.
5. Lower right instrument panel mounting bolt.
6. Left and right speaker and speaker grilles. Refer to Speakers in Audio Systems.
   - Electrical connections as necessary.
7. Windshield defroster grille using a flat-bladed tool.
8. Center sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
9. Lower left insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
10. Park brake release handle. Refer to Park Brake Lever Replacement in Parking Brake.
11. Knee bolster. Refer to Knee Bolster Replacement in this section.
12. Lower left instrument panel mounting bolt.
13. Truck body control module. Refer to Truck Body Control Module Replacement in Truck Body Control Module.
14. Disable the driver side SIR system. Refer to Disabling the SIR System in Restraints.
15. Instrument panel accessory trim plate. Refer to Accessory Trim Panel Trim Plate Replacement in this section.
16. Instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel and Gauges.
17. Radio. Refer to Radio Replacement in Audio Systems.

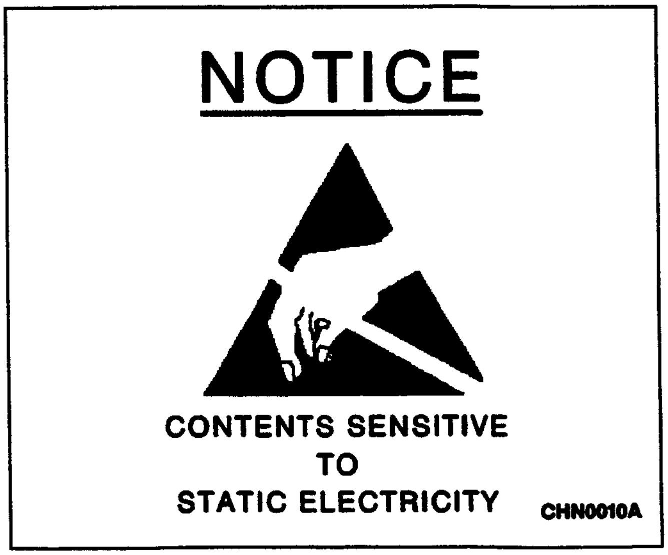

NOTICE
CONTENTS SENSITIVE TO STATIC ELECTRICITY
CHN0010A

Figure 1—Electrostatic Discharge Label

18. Knee deflector. Refer to Knee Deflector in this section.
19. Instrument panel driver knee bolster brackets.
20. Electrical connections as necessary.
21. Steering column from mounting studs. Refer to Steering Column Replacement in Steering Wheel and Column On-Vehicle Service.
22. HVAC control assembly. Refer to Control Assembly and Blower Switch in Heater and Ventilation.

Important

- Label all connections to avoid improper installation.

23. Top instrument panel screws.
24. Roll instrument panel down.
25. Electrical connections as necessary.
26. Instrument panel from the vehicle.

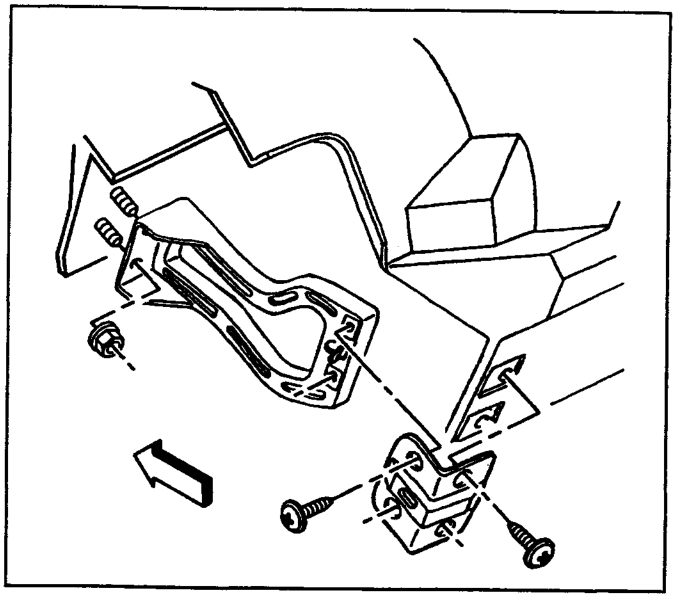


Figure 2—Instrument Panel Driver Knee Bolster Brackets

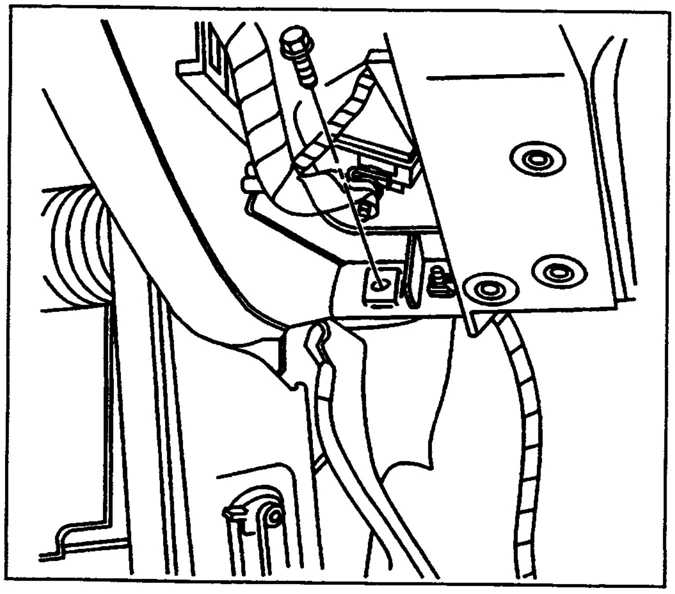


Figure 3—Lower Instrument Panel Mounting Bolt

Install or Connect (Figure 2 through 4)

1. Instrument panel to the vehicle.
2. Electrical connections as necessary.
3. Roll instrument panel up.
4. Top instrument panel screws.

Tighten

- Screws to 1.9 N·m (17 lb in).

5. HVAC control assembly. Refer to Control Assembly and Blower Switch in Heater and Ventilation.
6. Steering column to mounting studs. Refer to Steering Column Replacement in Steering Wheel and Column On-Vehicle Service.
7. Electrical connections as necessary.
8. Instrument panel driver knee bolster brackets.

Tighten

- Screws/Bolts to 6.3 N·m (56 lb in).

9. Knee deflector. Refer to Knee Deflector Replacement in this section.
10. Radio. Refer to Radio Replacement in Audio Systems.
11. Instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel and Gauges.
12. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in this section.
13. Enable the driver side SIR System. Refer to Enabling the SIR System in Restraints.
14. Truck body control module. Refer to Truck Body Control Module Replacement in Truck Body Control Module.
15. Lower left instrument panel bolt.

Tighten

- Bolt to 11.5 N·m (102 lb in)

16. Knee bolster. Refer to Knee Bolster Replacement in this section.

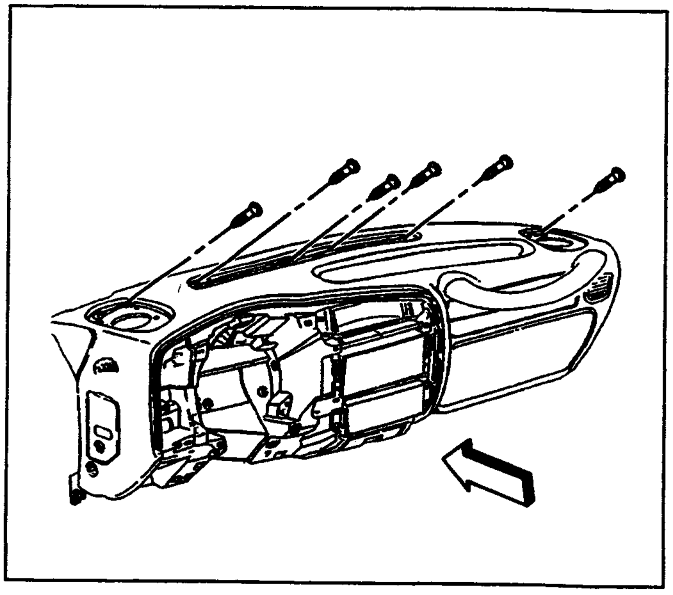


Figure 4—Top Instrument Panel Screws

17. Park brake release handle. Refer to Park Brake Lever Replacement in Parking Brake.
18. Lower left insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
19. Center sound insulator. Refer to Instrument Panel Sound Panel Sound Insulator Replacement in this section.
20. Windshield defroster grille.
21. Left and right speaker and speaker grilles. Refer to Speakers in Audio Systems.
22. Lower right instrument panel mounting bolt.

Tighten

- Bolt to 11.5 N.m (102 lb in).

23. Enable passenger side SIR System. Refer to Enabling the SIR System in Restraints.
24. Instrument panel storage compartment. Refer to Instrument Panel Storage Compartment Replacement in this section.
25. Right sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
26. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

STEERING COLUMN UPPER SUPPORT BRACKET REPLACEMENT

Important

- The steering column upper support bracket is not serviceable.

Remove or Disconnect (Figures 5 through 8)

1. Remove the instrument panel. Refer to Instrument Panel Replacement in this section.
2. Remove the brake switch. Refer to Stop Lamp Switch in Hydraulic Brakes.
3. Brake booster pushrod from brake pedal. Refer to Vacuum Brake Booster Replacement in Vacuum Booster System.
4. Remove the body harness connector (Figure 6).
5. Remove the steering column connector (Figure 7).
6. If the support bracket is being replaced, remove the steering column connector mounting bracket (Figure 8).
7. Remove six support bracket fasteners.
   - 4 flange nuts
   - 2 bolts
8. Remove the brake pedal from the support bracket. Refer to Brake Pedal Replacement in Hydraulic Brakes.

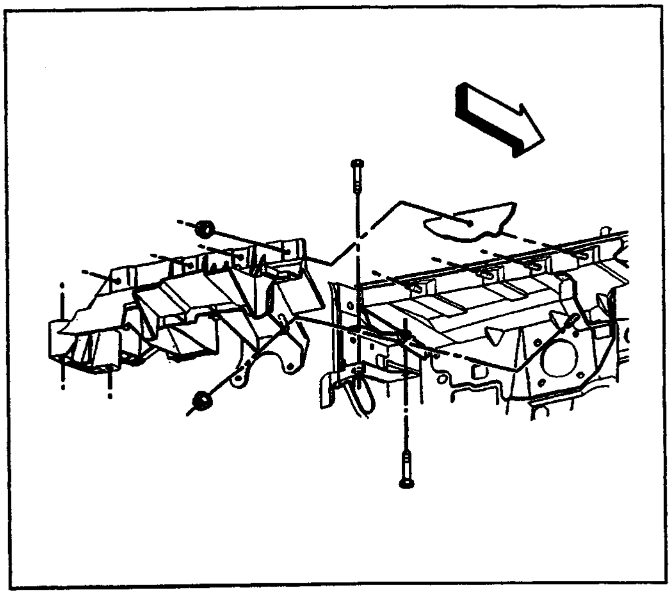


Figure 5—Steering Column Upper Support Bracket

Install or Connect (Figures 5 through 8)

1. Install the brake pedal to the support bracket. Refer to Brake Pedal in Hydraulic Brakes.

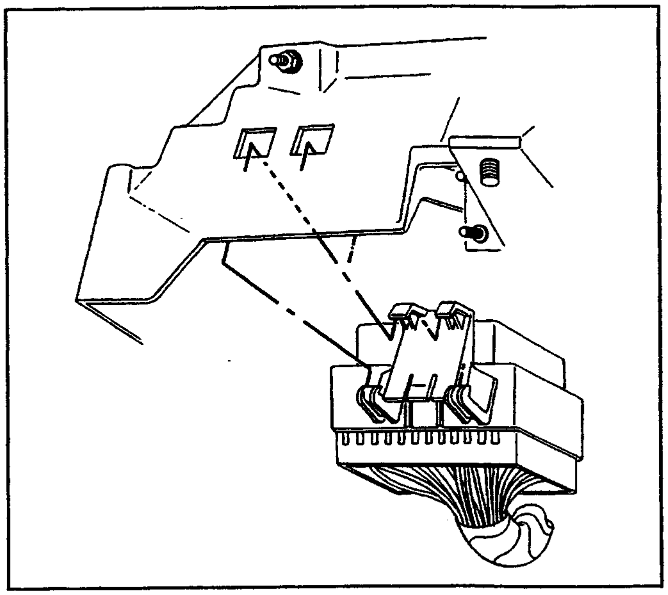


Figure 6—Body Harness Connector Mounting

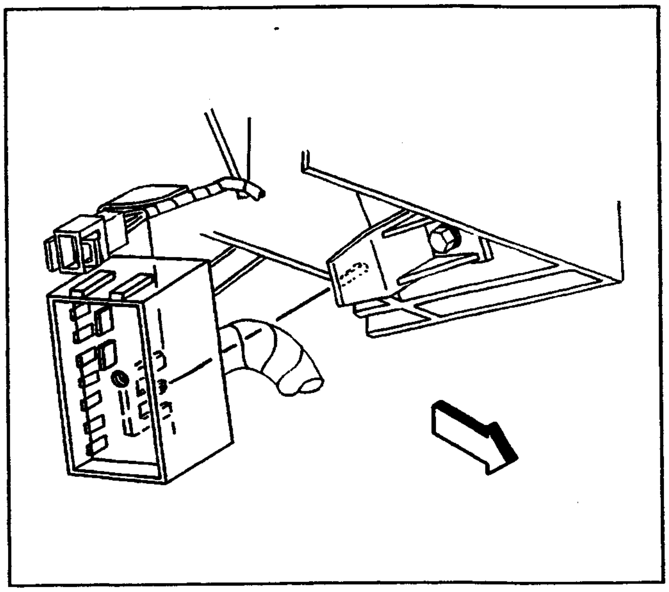


Figure 7—Steering Column Connector Mounting

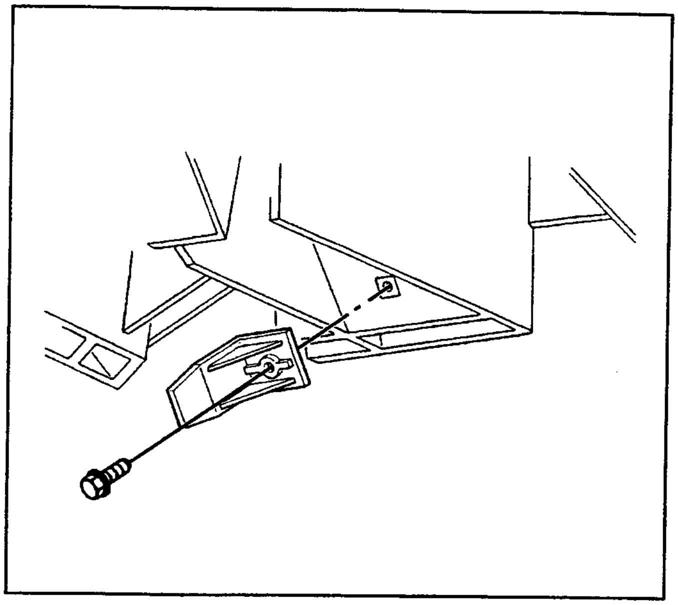


Figure 8—Steering Column Connector Mounting Bracket

2. Install six support bracket fasteners.

Tighten

- Nuts to 25 N.m (18 lb ft).
- Bolts to 25 N.m (18 lb ft).

3. Install the brake switch. Refer to Stop Lamp Switch in Hydraulic Brakes.
4. Install the brake booster pushrod to the brake pedal. Refer to Vacuum Brake Booster Replacement in Vacuum Booster System.
5. If the support bracket is being replaced, install the steering column connector mounting bracket to the support bracket with bolt (Figure 8).

Tighten

- Tighten bolt to 6 N.m (53 lb in).

6. Install the steering column connector (Figure 7).
7. Install the body harness connector (Figure 6).
8. Install the instrument panel. Refer to Instrument Panel Replacement in this section.

INSTRUMENT CLUSTER REPLACEMENT

NOTICE: ***When replacing a speedometer or odometer assembly, federal law requires that the odometer reading of the replacement unit be set to register the same mileage as the prior odometer. If the same mileage cannot be set, the law requires that the replacement odometer be set at zero and a label be installed on the driver's door frame to show the previous odometer reading and the date of replacement.***

Important

- All warning lamps use a Light Emitting Diode, (LED). The LED is not serviceable. If a warning lamp's LED stops functioning, the instrument cluster must be replaced. The high-beam indicator, turn signal indicators and the dash lights still use an incandescent bulb which is still serviceable.

Remove or Disconnect (Figure 9)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.
3. Four screws retaining cluster to instrument panel.
4. Electrical connections as necessary.
5. Cluster from instrument panel.

Install or Connect (Figure 9)

1. Cluster to the instrument panel. Firmly seat cluster onto the connector.
2. Electrical connections as necessary.
3. Screws.

Tighten

- Instrument cluster screws to 1.9 N.m (17 lb in).

4. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in Interior Trim.
5. Negative battery cable.
   - Note: For more information on the instrument cluster gauges, refer to Instrument Cluster.

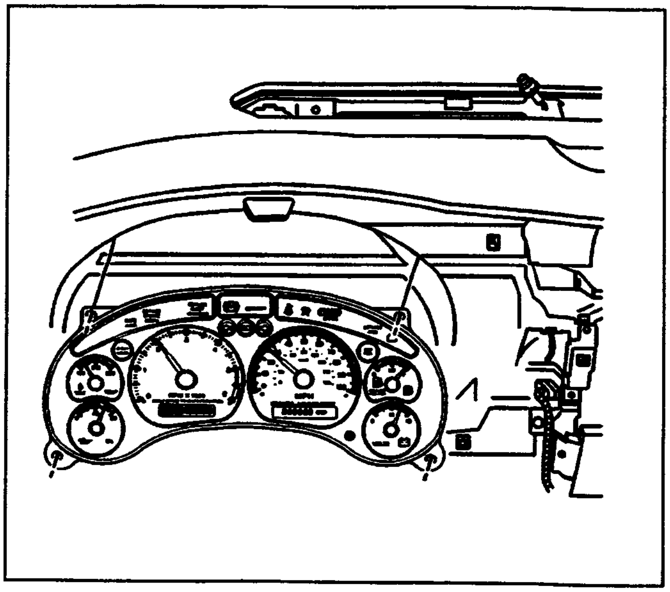


Figure 9—Instrument Cluster Replacement

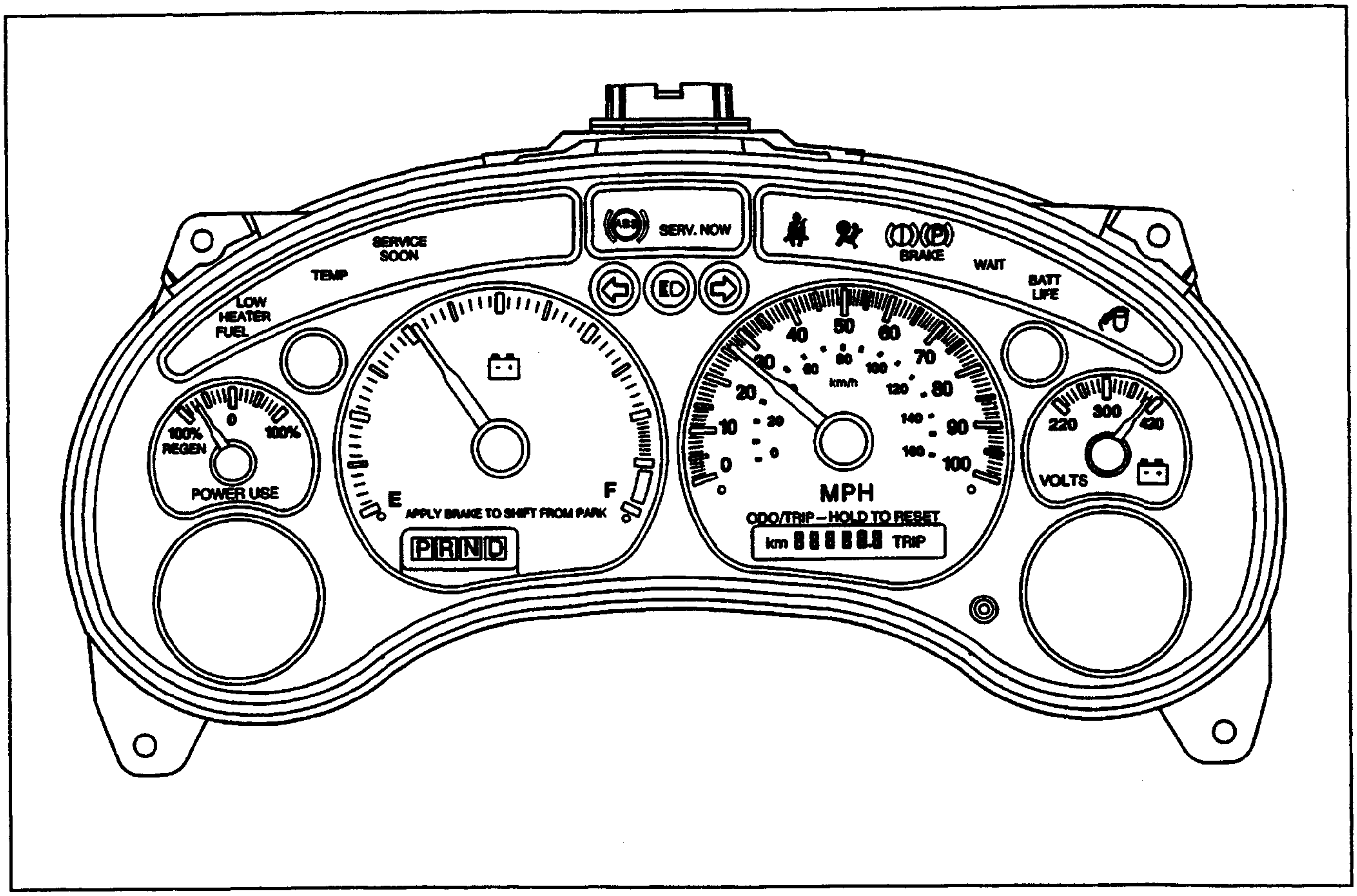

ABS
SERV. NOW
BRAKE
WAIT
BATT LIFE
SERVICE SOON
TEMP
LOW HEATER FUEL
100% REGEN
0
100%
POWER USE
E
F
APPLY BRAKE TO SHIFT FROM PARK
P R N D
0
10
20
30
40
50
60
70
80
90
100
20
40
60
80
100
120
140
160
km/h
MPH
ODO/TRIP – HOLD TO RESET
km 888888 TRIP
220
300
420
VOLTS

Figure 10—Instrument Cluster Replacement

INSTRUMENT CLUSTER LENS REPLACEMENT

Remove or Disconnect

1. Instrument cluster. Refer to Instrument Cluster Replacement in this section.
2. Lens retaining tabs and lens from the cluster housing.

Install or Connect

1. Lens and lens retaining tabs to the cluster panel.
2. Instrument cluster. Refer to Instrument Cluster Replacement in this section.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N·m	Lb Ft	Lb In
Instrument Cluster Screws	1.9	—	17
Lower Left Instrument Panel Bolt	11.5	—	102
Lower Right Instrument Panel Bolt	11.5	—	102
Lens Retaining Screws	1.9	—	17
Steering Column Upper Support Bracket Bolts	25	18	—
Steering Column Upper Support Bracket Nuts	25	18	—
Steering Column Nuts	30	22	—

BLANK

SECTION 8C1

INSTRUMENT PANEL CLUSTER (IPC)

Typical Scan Tool Data Values

Use the *Typical Scan Tool Data Values* listed in this section for comparison after the Instrument Panel Cluster (IPC) System Check and finding the on board diagnostics are functioning properly with no diagnostic trouble codes displayed.

The *Typical Scan Tool Data Values* are an average of displayed values recorded from normally operating vehicles. The Typical Scan Tool Data Values are intended to represent what a normally functioning system would display with certain preliminary settings. The values you get may vary slightly due to a low battery charge or other reasons. But they should be very close.

Notice: Do not use a scan tool that displays faulty data. Report the problem to the manufacturer. The use of a faulty scan tool can result in misdiagnosis and unnecessary parts replacement.

Use only the parameters listed in the tables for diagnosis. If a scan tool reads other parameters, the values are not recommended for use in diagnosis. For more description on the scan tool Typical Data Values and the use of the scan tool in order to diagnosis the Instrument Panel Cluster (IPC), refer to the *Applicable Diagnostic Trouble Code (DTC) Table.* If all values are within the range illustrated, Refer to the *IPC Symptom ReferenceTable* in this section.

Typical Scan Tool Data Display

Preliminary Settings: The following preliminary settings must be set in order to achieve the same typical data values listed in the table.

- Parking Brake Set With Ignition OFF (DRL and AHL Disabled)
- Ignition On
- Engine On
- Transmission in PARK
- Air Conditioning OFF

Data

Scan Tool Parameter	Units Displayed	Typical Data Value
Vehicle Speed	Miles Per Hour	0 MPH
Engine Speed	Revolutions Per Minute (RPM)	500 - 700 RPM (Varies with Vehicle)
Displayed Odometer Mile	Miles	XXX,XXX Miles (Varies with Vehicle's Mileage)
Displayed Trip Odometer	Miles	X,XXX.X Miles (Varies with Vehicle's Mileage)
Battery Voltage	Volts	13.8 Volts (Varies with Vehicle) 12.0 volts - 14.7 volts

Inputs

Scan Tool Parameter	Units Displayed	Typical Data Value
PRND State	Park / Reverse / Neutral / Drive / Invalid	Park
Dimming	Active / Inactive	Active
Park Switch	Open / Closed	Closed
Trip Reset Switch	Active / Inactive	Inactive

Important: The output table shown below does not list all of the IPC LED's. The IPC LED's not listed are controlled by a different device. Refer to the *applicable device* when diagnosing IPC LED's not shown in the below table.

Outputs

Scan Tool Parameter	Units Displayed	Typical Data Value
ABS Lamp	ON / OFF	OFF
Brake Lamp	ON / OFF	ON
Fasten Seat Belts	ON / OFF	ON
Service Now	ON / OFF	OFF
High Beam Lamp	ON / OFF	OFF
Paddle Present	ON / OFF	OFF

Typical Scan Tool Data Definitions

The Instrument Panel Cluster (IPC) Scan Tool Data Display Values and Definition information can assist in diagnosing Instrument Panel Cluster related problems, especially when no Diagnostic Trouble Codes (DTC) are stored in memory. A vehicle's scan tool data can be compared with the data display values from a known good vehicle in the Scan Tool Data Display Table. When data from the vehicle differs from the typical data display value, the data definition information will help in understanding the nature of the difference and the source of the problem.

Data

Vehicle Speed - Range: 0 MPH - 120 MPH

This data is the cluster's measurement of the vehicle's speed from a discrete input from the VCM/PCM.

Displayed Odometer Mile - 0 Miles - 999,999 Miles

This data refers to the displayed Odometer mileage on the Odometer display.

Displayed Trip Odometer - Range: 0 Miles - 9,999.9 Miles

This data refers to the displayed Trip Odometer mileage displayed on the Trip Odometer display.

Inputs

PRND State - Range: Park / Reverse / Neutral / Drive / Invalid

This data input refers to the PRND position data that is communicated to the cluster over the Class 2 serial data line by the BPCM. The value of this parameter corresponds to the gear that is selected on the PRND display. The value of this parameter will be INVALID under the following conditions:

- The data from the Park Position Switch is INVALID.
- The data from the Park Position Switch is PARK but the cluster does not see ground on its park switch input (pin A12).
- The data from the Park Position Switch is not PARK but the cluster sees ground on its park switch input (pin A12).
- A Class 2 communication failure has occurred.

When the value of this parameter is INVALID, no gear will be shown as selected on the PRND display.

Dimming - Range: Active / Inactive

This data refers to the dimming availability feature of the PRND and Odometer/Trip Odometer vacuum florescent displays. ACTIVE is displayed when the PRND and Odometer/Trip Odometer vacuum florescent displays can be dimmed using the dimming thumbwheel switch. INACTIVE is displayed when the PRND and Odometer/Trip Odometer vacuum florescent displays cannot be dimmed using the dimming thumbwheel displays.

Park Switch - Range: Open / Closed

This data input refers to the state of the gear shift PARK position switch. OPEN is displayed when the gear shift is not in park. CLOSED is displayed when the gear shift is in the PARK position and the gearshift lever is at it's normal rest position.

Trip Reset Switch - Range: Active / Inactive

This data refers to the position of the Trip Odometer Reset switch. ACTIVE is displayed when the Trip Reset switch is pushed in. INACTIVE is displayed when the Trip Reset switch is in it's normal position (not pushed in).

Outputs

ABS Lamp - Range: ON / OFF

This output refers to the commanded state of the ABS lamp illumination by the IPC module. ON is displayed when the IPC module is commanding the ABS lamp to be illuminated. OFF is displayed when the IPC module is not commanding the ABS lamp to be illuminated. The IPC will command the ABS lamp to be illuminated under the following conditions:

- It receives a Class 2 message from the Electronic Brake Control Module (EBCM) indicating there is a malfunction in the ABS system
- During the bulb check period for 3 seconds after the ignition switch is first turned to RUN.
- A Class 2 communication failure occurs.

Brake Lamp - Range: ON / OFF

This output refers to the commanded state of the BRAKE lamp illumination by the IPC module. ON is displayed when the IPC module is commanding the BRAKE lamp to be illuminated when 1) it receives a Class 2 message from the Truck Body Control Module (TBC) that the Parking Brake is set, 2) it receives a Class 2 message from the Electronic Brake Control Module (EBCM) that there is a problem with the base brake system (non-ABS portion) or, 3) during the bulb check period for 3 seconds after the ignition switch is first turned to RUN. OFF is displayed when the IPC module is not commanding the BRAKE lamp to be illuminated.

Fasten Seat Belts - Range: ON / OFF

This output refers to the commanded state of the FASTEN SEAT BELTS lamp illumination by the IPC module. ON is displayed when the IPC module is commanding the FASTEN SEAT BELTS lamp to be illuminated for 20 seconds followed by 55 seconds flashing when it receives a Class 2 message from the Truck Body Control Module (TBC) that the driver's seat belt is not buckled or 2) during the bulb check period for about 3 seconds after the ignition switch is first turned to RUN providing the driver's seat belt is buckled. OFF is displayed when the IPC module is not commanding the FASTEN SEAT BELTS lamp to be illuminated.

Service Now - Range: ON / OFF

This output refers to the commanded state of the SERVICE NOW lamp illumination by the IPC module. ON is displayed when the IPC module is commanding the SERVICE NOW lamp to be illuminated. OFF is displayed when the IPC module is not commanding the SERVICE NOW lamp to be illuminated. The IPC will command the SERVICE NOW lamp to be illuminated under the following conditions:

- It receives a Class 2 message from the Truck Body Control Module (TBC) or the BPCM.
- During the bulb check period for about 3 seconds after the ignition switch is first turned to RUN.
- A Class 2 communication failure occurs.

High Beam Lamp - Range: ON / OFF

This output refers to the commanded state of the High Beam lamp illumination by the IPC module. ON is displayed when the IPC module is commanding the High Beam lamp to be illuminated when it receives a Class 2 message from the Truck Body Control Module (TBC). OFF is displayed when the IPC module is not commanding the High Beam lamp to be illuminated.

Paddle Present - Range: ON / OFF

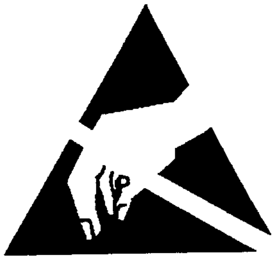
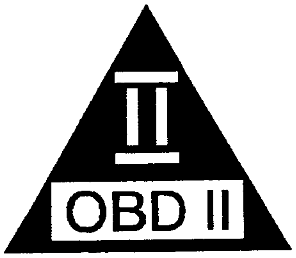
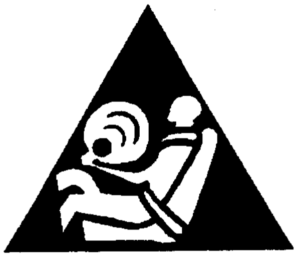
This output refers to the commanded state of the PADDLE PRESENT TELLTALE by the IPC. ON is displayed when the IPC is commanding the TELLTALE lamp to be illuminated. OFF is displayed when the IPC is not commanding the TELLTALE to be illuminated. The IPC will command the TELLTALE to be illuminated under the following conditions:

- It receives a Class 2 message from the BPCM indicating that there is a charging present.

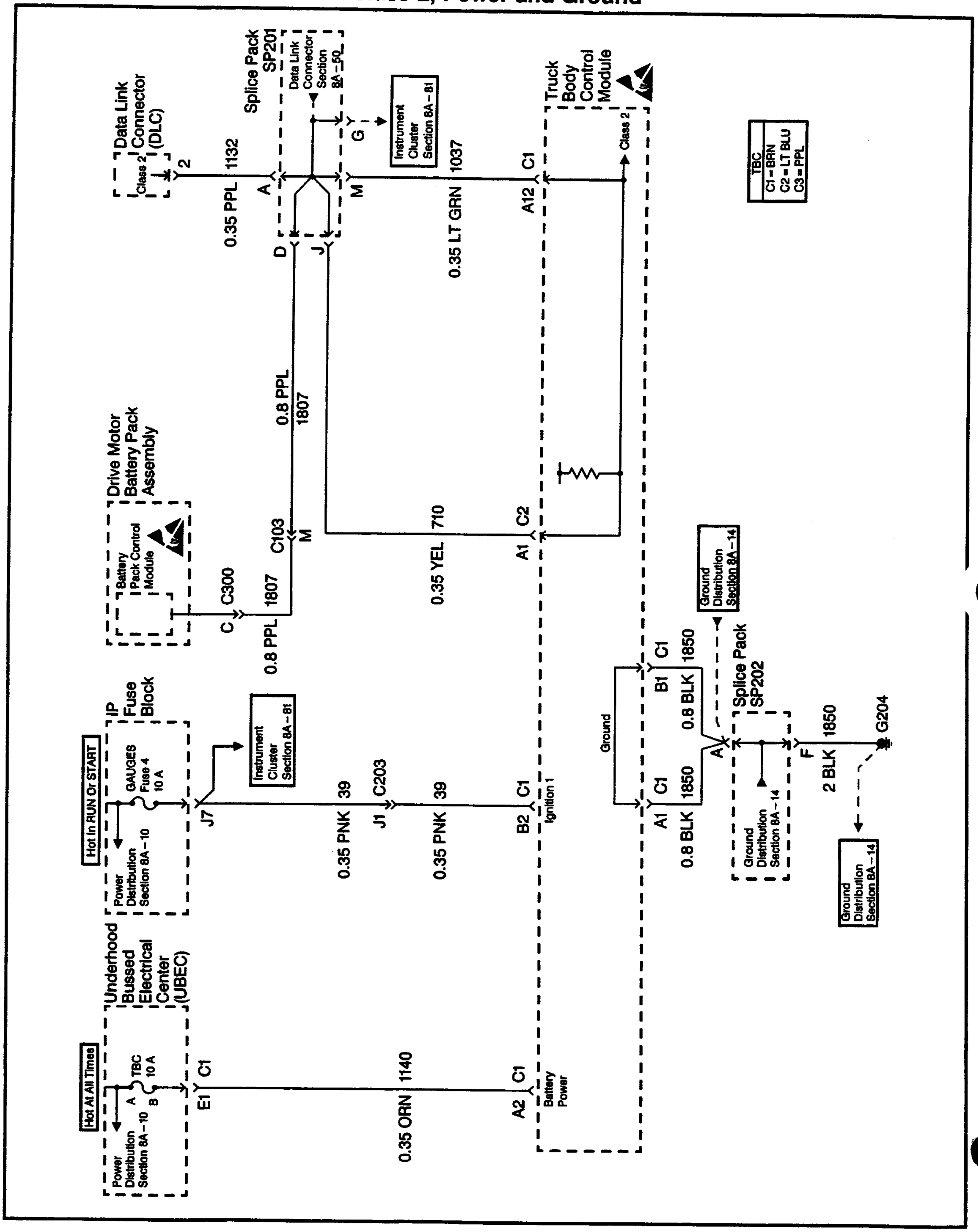
Instrument Panel Cluster Schematic Reference Table

Reference on Schematic	Section Number Subsection Name
Symbols	8A-3 Symbols
Troubleshooting Procedures	8A-4 Troubleshooting Procedures
Repair Procedures	8A-5 Repair Procedures
Power Distribution	8A-10 Power Distribution
Ground Distribution	8A-14 Ground Distribution
Retained Accessory Power	8A-15 Retained Accessory Power
Horns	8A-40 - Horns
Brake Warning System	8A-41 - Brake Warning System
Data Link Connector (DLC)	8A-50 - Data Link Connector (DLC)
Truck Body Control Module (TBC)	8A-51 - Truck Body Control Module
Vehicle Speed	8A-76 - Audible Warnings
Head Lamp Reminder	8A-76 - Audible Warnings
Key In Reminder	8A-76 - Audible Warnings
Seat Belt Reminder	8A-76 - Audible Warnings
Turn Signal Reminder	8A-76 - Audible Warnings
Instrument Panel Cluster (IPC)	8A-81 Instrument Panel Cluster (IPC)
Head Lamps	8A-100 Head Lamps
Daytime Running Lamps	8A-102 Daytime Running Lamps
Exterior Lights	8A-110 Exterior Lights
Backup Lights	8A-112 Backup Lights
Interior Lights	8A-114 Interior Lights
Interior Lights Dimming	8A-117 Interior Lights Dimming
Column/Ignition Lock	8A-139 Column/Ignition Lock
Radio/Audio Systems	8A-150 Radio/Audio Systems

Instrument Panel Cluster Schematic Icons

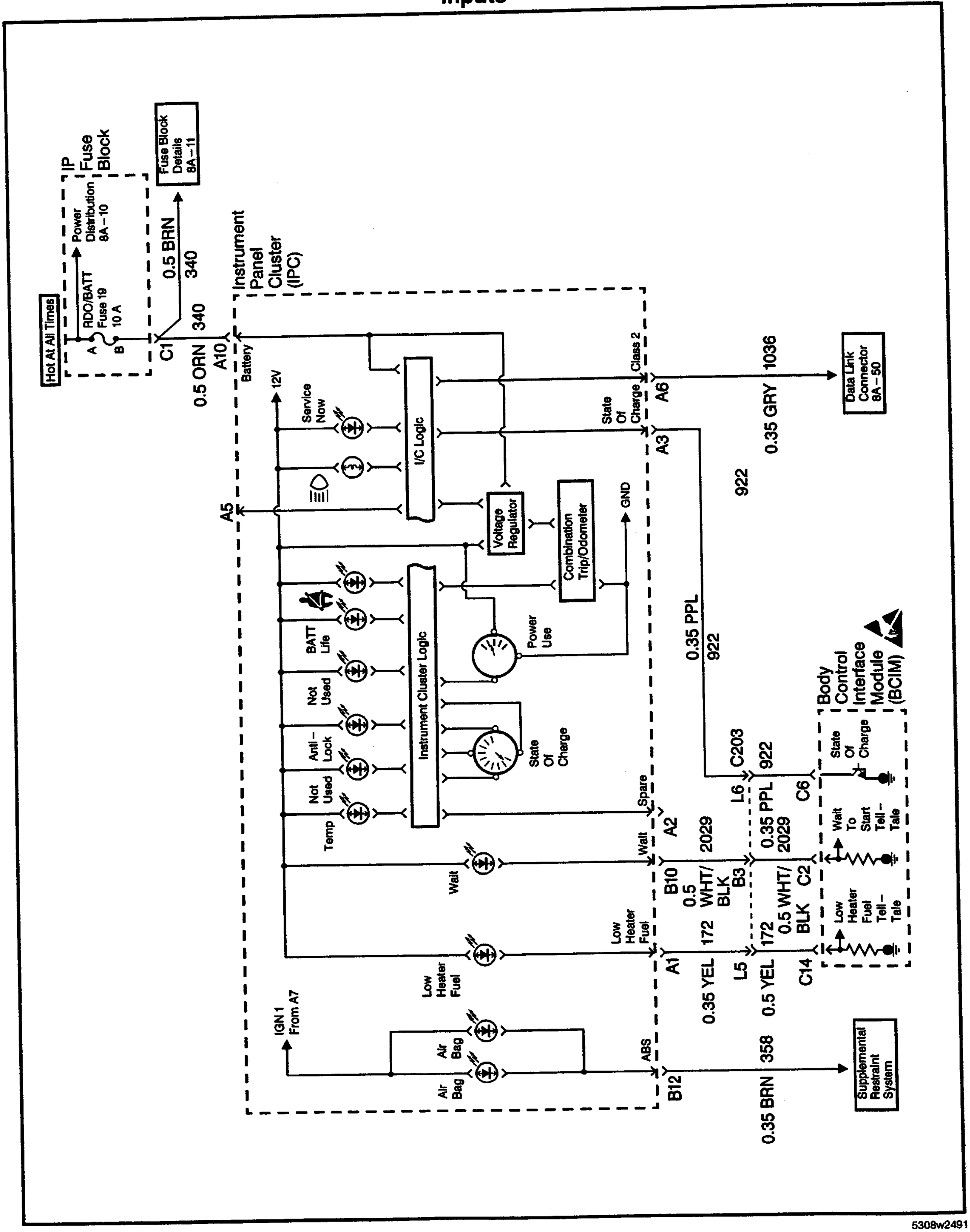
19384 	Refer to *Electrostatic Discharge (ESD) Sensitive Devices in 8A-3 Symbols.*
19385 	Refer to *ON Board Diagnostic II (OBD II) Symbols in 8A-3 Symbols.*
19386 	Refer to *Supplemental Inflatable Restraints (SIR) Systems in 8A-3 Symbols.*

Instrument Panel Cluster Schematics
Class 2, Power and Ground


Data Link Connector (DLC)
Class 2
2
1132
0.35 PPL
Splice Pack SP201
A
D
J
M
G
Y
Data Link Connector Section 8A-50
Instrument Cluster Section 8A-81
1037
0.35 LT GRN
C1
A12
Truck Body Control Module
Class 2
Drive Motor Battery Pack Assembly
Battery Pack Control Module
C
C300
1807
0.8 PPL
C103
M
0.8 PPL
1807
710
0.35 YEL
C2
A1
IP Fuse Block
Hot In RUN Or START
GAUGES Fuse 4 10 A
Power Distribution Section 8A-10
J7
Instrument Cluster Section 8A-81
39
0.35 PNK
C203
J1
39
0.35 PNK
C1
B2
Ignition 1
Ground
C1
B1
1850
0.8 BLK
C1
A1
1850
0.8 BLK
Ground Distribution Section 8A-14
Splice Pack SP202
A
F
1850
2 BLK
G204
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
TBC
C1 = BRN
C2 = LT BLU
C3 = PPL
Underhood Bussed Electrical Center (UBEC)
Hot At All Times
TBC 10 A
A
B
Power Distribution Section 8A-10
C1
E1
1140
0.35 ORN
C1
A2
Battery Power

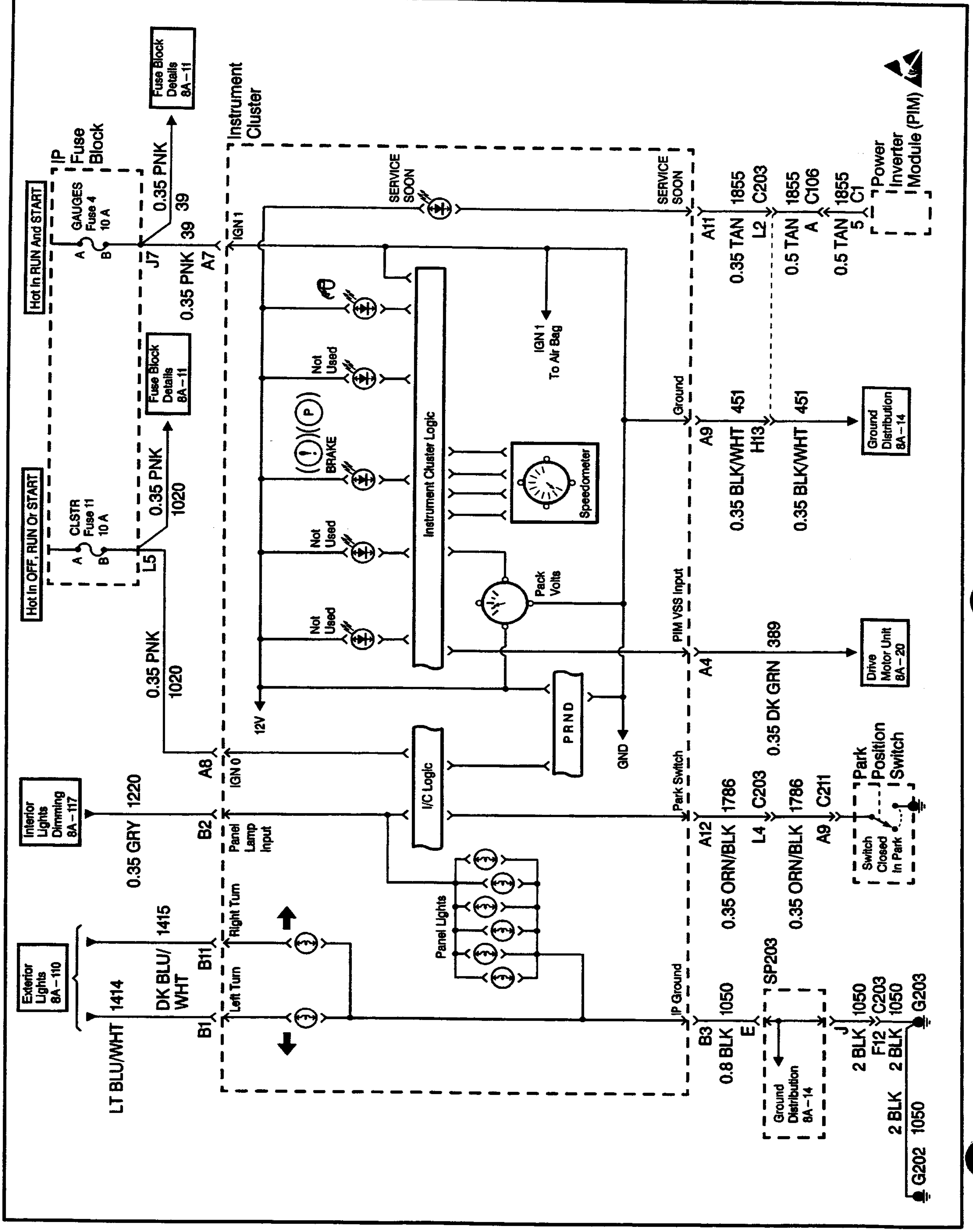
5308w3270

Inputs

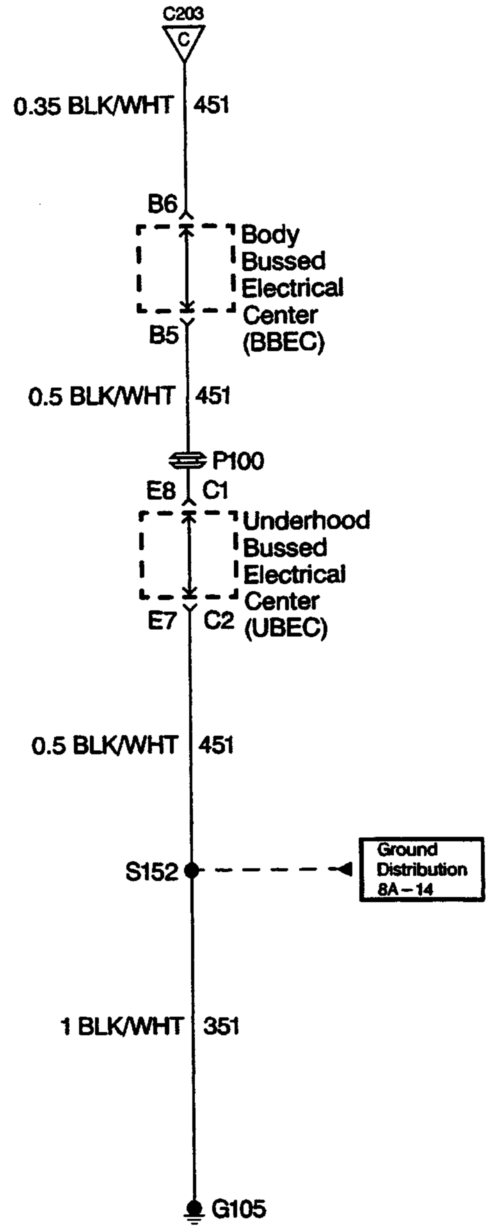

Hot At All Times
IP Fuse Block
RDO/BATT Fuse 19 10 A
A
B
Power Distribution 8A-10
Fuse Block Details 8A-11
C1
0.5 BRN
340
340
0.5 ORN
A10
Battery
Instrument Panel Cluster (IPC)
12V
Service Now
I/C Logic
A5
Voltage Regulator
Combination Trip/Odometer
GND
Class 2
State Of Charge
A6
A3
1036
0.35 GRY
Data Link Connector 8A-50
922
Instrument Cluster Logic
BATT Life
Power Use
Not Used
Anti-Lock
State Of Charge
Not Used
Temp
0.35 PPL
922
Wait
Low Heater Fuel
Low Heater Fuel
Air Bag
Air Bag
IGN 1 From A7
Spare
A2
Wait
B10
0.5 WHT/BLK
2029
B3
Low Heater Fuel
A1
172
0.35 YEL
L5
172
0.5 YEL
C14
C203
L6
922
0.35 PPL
2029
0.5 WHT/BLK
C2
C6
Body Control Interface Module (BCIM)
State Of Charge
Wait To Start Tell-Tale
Low Heater Fuel Tell-Tale
ABS
B12
358
0.35 BRN
Supplemental Restraint System

5308w2491

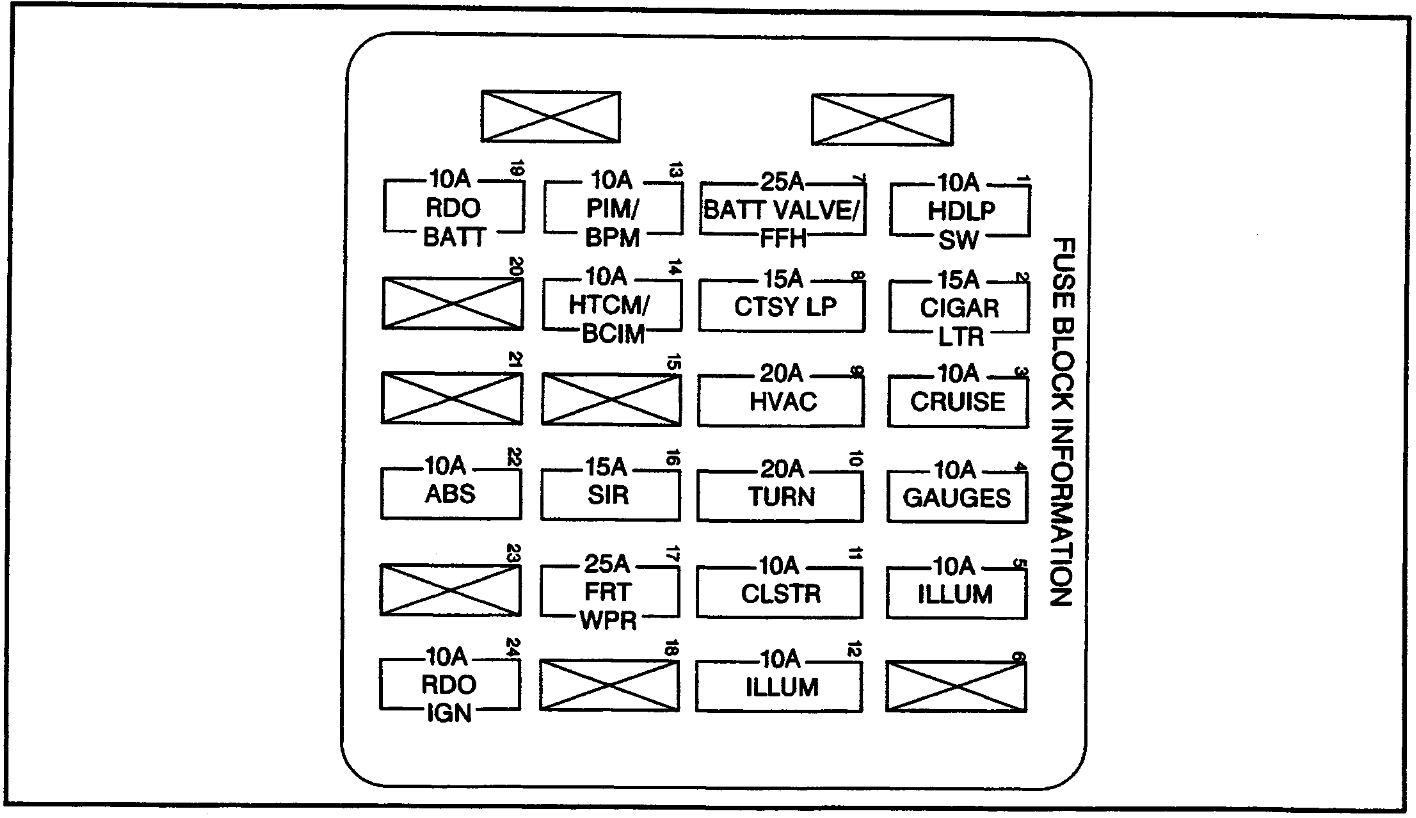
Inputs


Hot In RUN And START
Hot In OFF, RUN Or START
IP Fuse Block
GAUGES Fuse 4 10 A
CLSTR Fuse 11 10 A
A
B
J7
L5
0.35 PNK
39
1020
Fuse Block Details 8A–11
Instrument Cluster
A7
A8
B2
B11
B1
IGN 1
IGN 0
Panel Lamp Input
Right Turn
Left Turn
Interior Lights Dimming 8A–117
0.35 GRY
1220
Exterior Lights 8A–110
LT BLU/WHT
1414
DK BLU/WHT
1415
SERVICE SOON
Not Used
BRAKE
Instrument Cluster Logic
Speedometer
Pack Volts
PRND
I/C Logic
Panel Lights
12V
GND
IGN 1 To Air Bag
Ground
PIM VSS Input
Park Switch
IP Ground
A11
A9
A4
A12
B3
0.35 TAN
1855
L2
C203
0.5 TAN
A
C106
5
C1
Power Inverter Module (PIM)
0.35 BLK/WHT
451
H13
Ground Distribution 8A–14
0.35 DK GRN
389
Drive Motor Unit 8A–20
0.35 ORN/BLK
1786
L4
C211
Park Position Switch
Switch Closed In Park
0.8 BLK
1050
E
SP203
J
2 BLK
F12
C203
G203
G202

Instrument Panel Ground

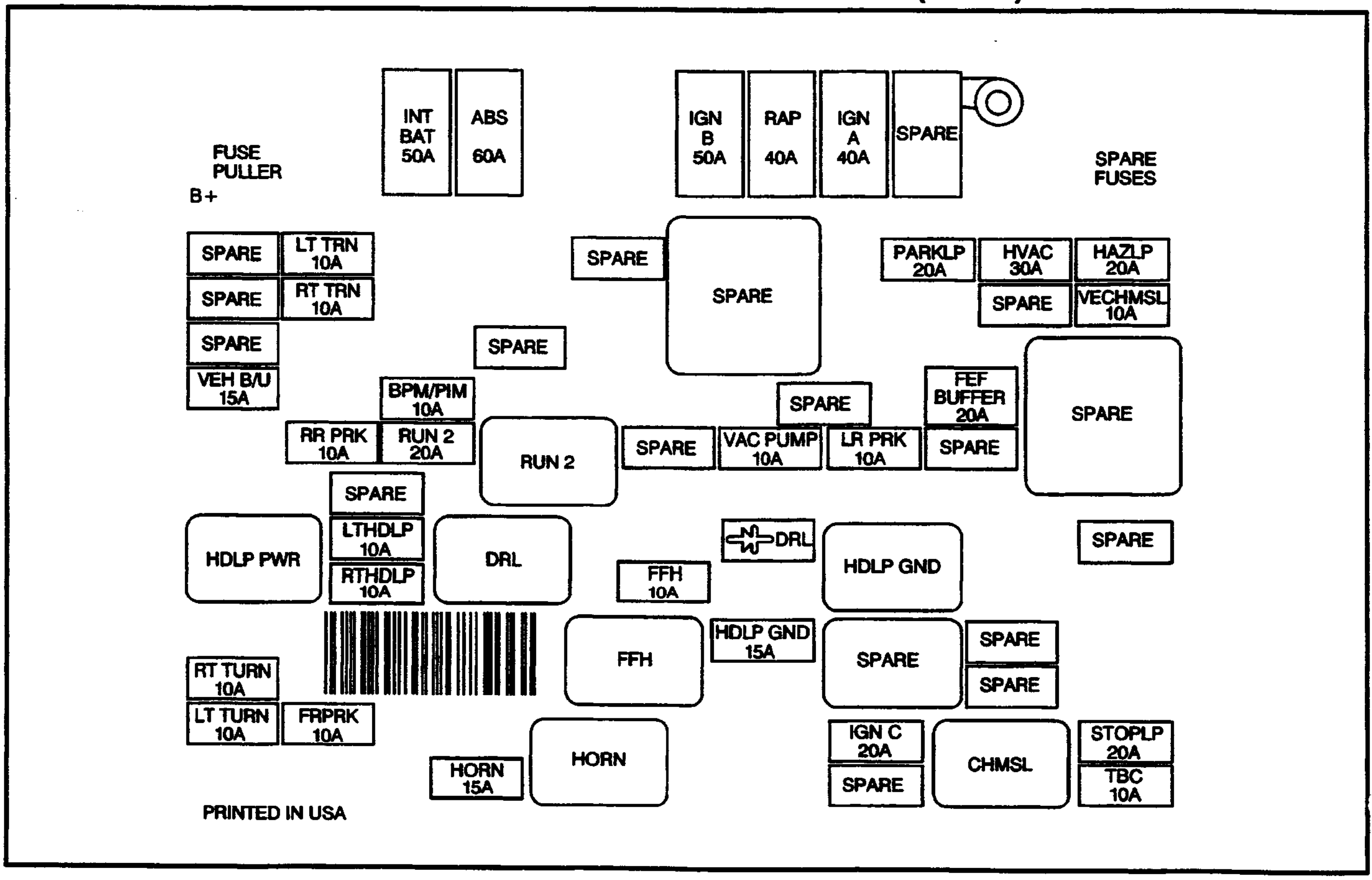

C203
C
0.35 BLK/WHT
451
B6
Body
Bussed
Electrical
Center
(BBEC)
B5
0.5 BLK/WHT
451
P100
E8
C1
Underhood
Bussed
Electrical
Center
(UBEC)
E7
C2
0.5 BLK/WHT
451
S152
Ground
Distribution
8A-14
1 BLK/WHT
351
G105

Instrument Panel Fuse Block


10A RDO BATT 19
10A PIM/ BPM 13
25A BATT VALVE/ FFH 7
10A HDLP SW 1
20
10A HTCM/ BCIM 14
15A CTSY LP 8
15A CIGAR LTR 2
21
15
20A HVAC 9
10A CRUISE 3
10A ABS 22
15A SIR 16
20A TURN 10
10A GAUGES 4
23
25A FRT WPR 17
10A CLSTR 11
10A ILLUM 5
10A RDO IGN 24
18
10A ILLUM 12
6
FUSE BLOCK INFORMATION

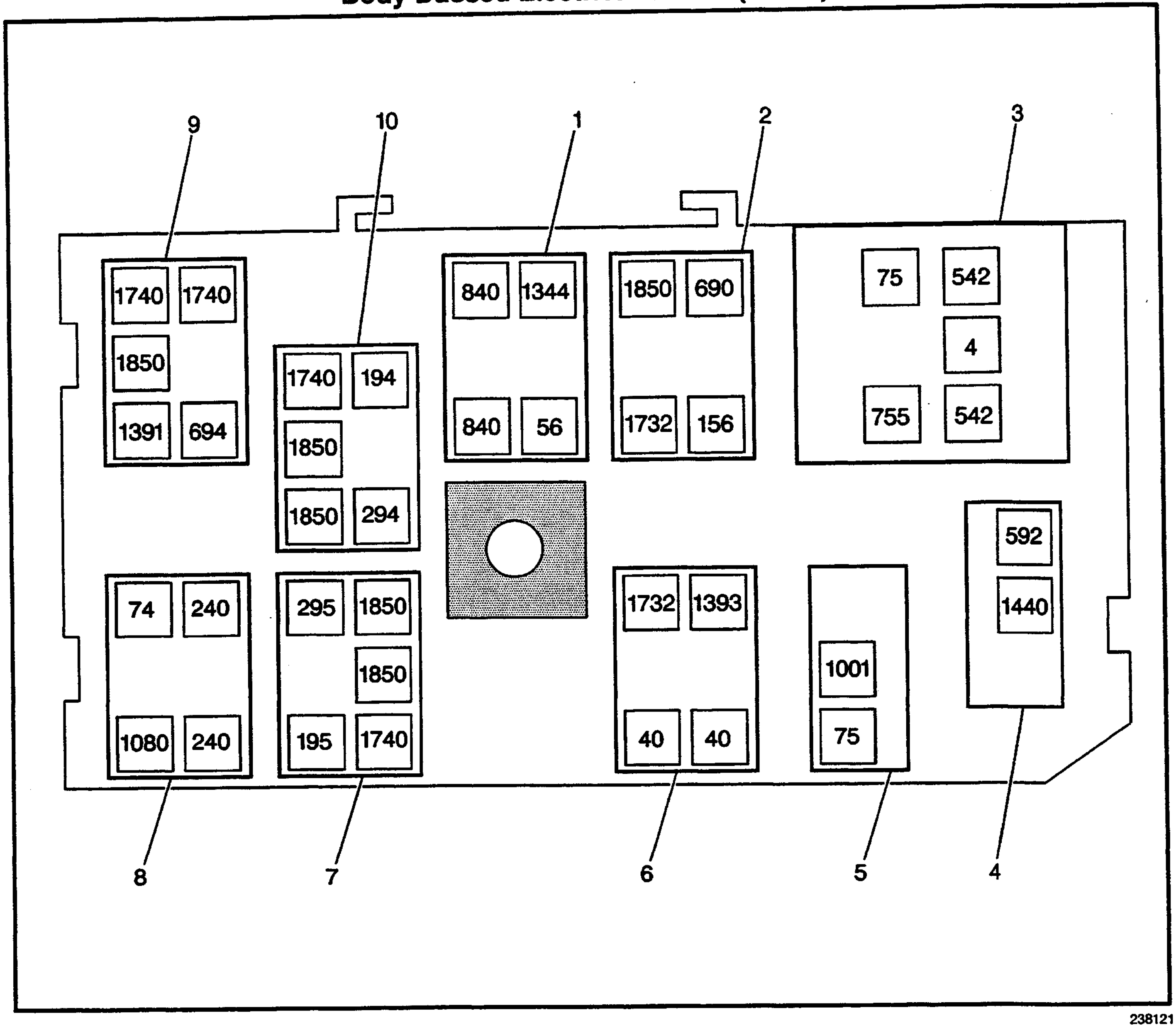
5308w3254

Underhood Bussed Electrical Center (UBEC)


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA

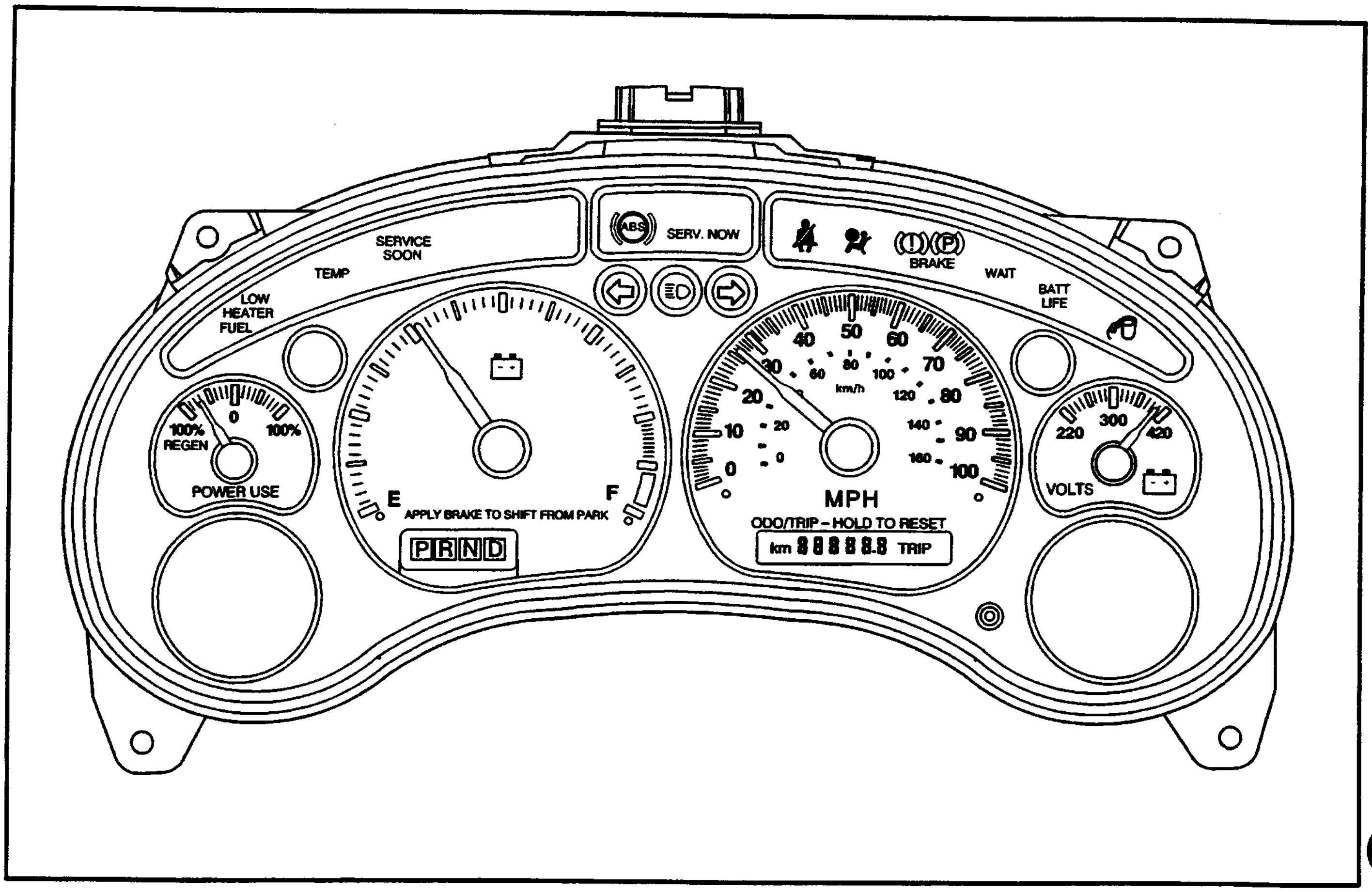
5308w3246

Body Bussed Electrical Center (BBEC)


9
10
1
2
3
1740
1740
1850
1391
694
1740
194
1850
1850
294
840
1344
840
56
1850
690
1732
156
75
542
4
755
542
592
1440
74
240
1080
240
295
1850
1850
195
1740
1732
1393
40
40
1001
75
8
7
6
5
4
238121

Legend
1. Lift Glass Relay.
2. Courtesy Lamp Relay.
3. Retained Accessory Power Relay
4. Power Seats Circuit Breaker.
5. Power Windows Circuit Breaker.
6. Inadvertent Power Relay.
7. Door Lock Relay.
8. Park Lamp Relay.
9. Driver Door Lock Relay.
10. Door Unlock Relay.

Instrument Panel Cluster

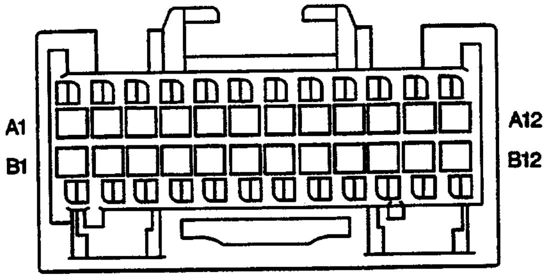


SERVICE SOON
TEMP
LOW HEATER FUEL
ABS
SERV. NOW
BRAKE
WAIT
BATT LIFE
100% REGEN
0
100%
POWER USE
E
F
APPLY BRAKE TO SHIFT FROM PARK
P R N D
0
10
20
30
40
50
60
70
80
90
100
20
40
60
80
100
120
140
160
km/h
MPH
ODO/TRIP - HOLD TO RESET
km 888888.8 TRIP
220
300
420
VOLTS

2608w2883

Instrument Panel Cluster (IPC) Connector End View

IPC Connector C1



gg 239859

Connector Part Information	- 12110206 - 24 Way F Micro-Pack 100 Series (GRAY)

Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symtoms From a Faulty Circuit
A1	YEL	172	Low Heater Fuel	C203 Terminal L5, BCIM Terminal C14	—	Low Fuel Heater telltale may be Inoperative
A2	—	—	Not Used	—	—	—
A3	PPL	922	State of Charge	C203 Terminal L6, BCIM Terminal C6	—	State of Charge Gauge may be Inoperative
A4	DK GRN	389	Vehicle Speed Signal Input - 4000 Pulses Per Mile Input	Splice pack 200 Terminal F	—	Speedometer and Odometer Inoperative and Turn Signal Reminder Inoperative
A5	—	—	Not Used	—	—	—
A6	GRA	1036	Class 2 Serial Data Line	C203 Terminal L7, Splice Pack 201 Terminal G, Splice Pack 201 Terminal A, DLC Terminal 2	—	—
A7	PNK	39	Ignition 1 Input	GAUGES Fuse	—	—
A8	PNK	1020	Ignition 0 Input	CLSTR Fuse	—	—
A9	BLK/WHT	451	Ground for the IPC	C203 Terminal H13 and BBEC B5, B6 and UBEC C1 terminal E8, and UBEC C2 terminal E7, and S152, and G105	—	—

IPC Connector C1 (continued)

Connector Part Information	
	• 12110206 • 24 Way F Micro-Pack 100 Series (GRAY)

Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symtoms From a Faulty Circuit
A10	ORN	340	Battery Power Input	RDO BATT Fuse	—	—
A11	BRN/WHT	1855	SERVICE SOON LAMP Control	C203 Terminal L2, C106 terminal A, PIM Connector C1 terminal 5	—	Service Soon Lamp Inoperative
A12	ORN/BLK	1786	Park Switch Signal	C203 Terminal L4, C211	—	PRND Display Inoperative
B1	LT BLU/ WHT	1414	Left Turn Signal Switch Input	—	—	Left Turn Signal Bulb may be Inoperative
B2	GRA	1220	ILLUM Fuse Input for Dimming Control	ILLUM Fuse	—	Dimming Inoperative with Park Lamps ON
B3	BLK	1050	Ground	Splice Pack 203 Terminal E, and Splice Pack 203 Terminal J and G203	—	—
B4	—	—	Not Used	—	—	—
B5	—	—	Not Used	—	—	—
B6	—	—	Not Used	—	—	—
B7	—	—	Not Used	—	—	—
B8	—	—	Not Used	—	—	—
B9	—	—	Not Used	—	—	—
B10	WHT/BLK	2029	Wait Telltale	C203 Terminal B3, BCIM Terminal C2	—	—
B11	DK BLU/ WHT	1415	Right Turn Signal Switch Input	—	—	Turn Signal Bulb may be Inoperative
B12	BRN	358	Input from the SIR Module for the SIR Indicator Lamp Control	Terminal E5	B1480 B2617	SIR Indicator Lamp may not function properly

(*) For more information refer to *Typical Scan Tool Data Values* within this section.

Instrument Panel Cluster Diagnostic Trouble Code List

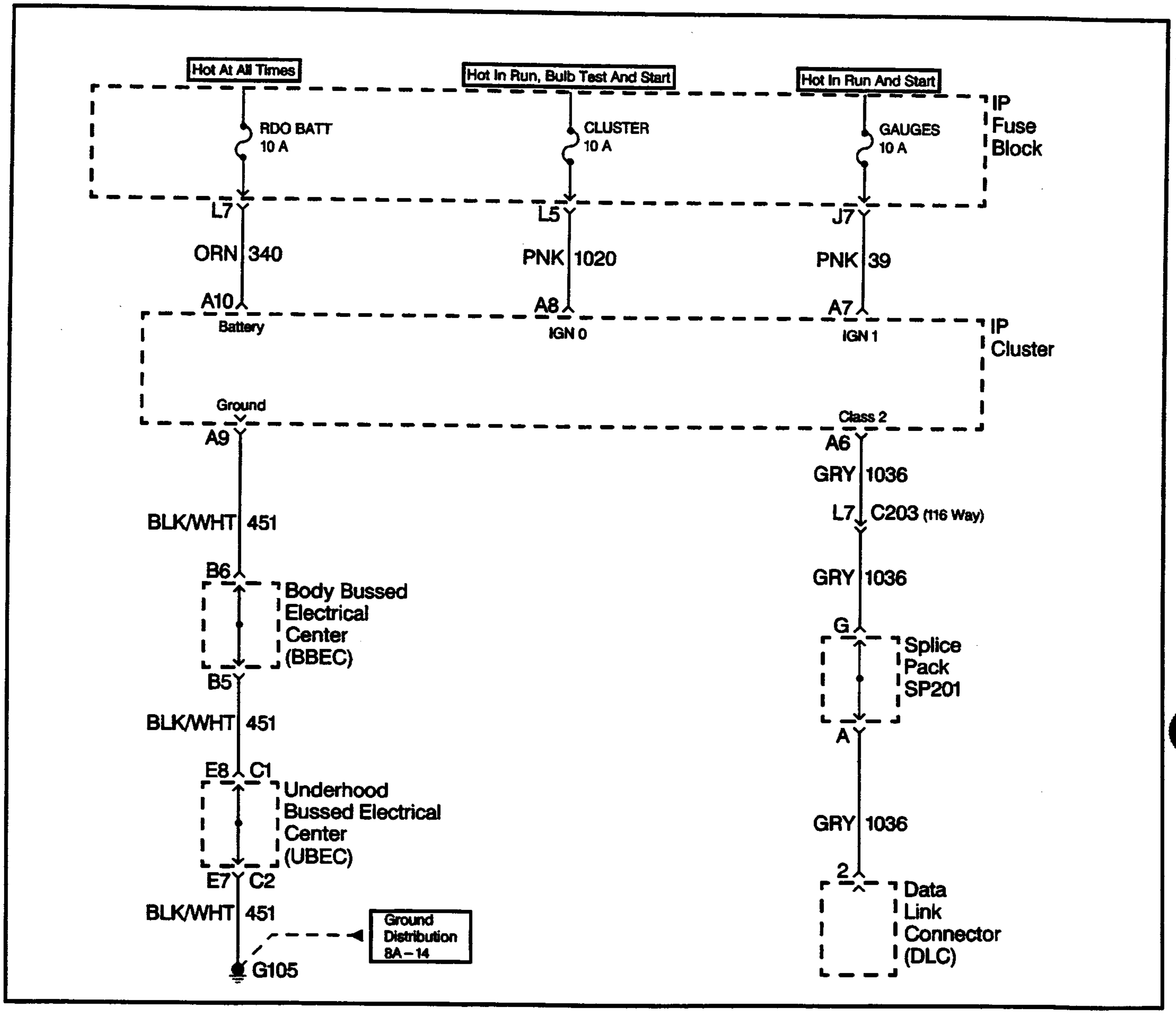
DTC	Description	Telltales Illuminated
B1367	Device Ignition 0 Circuit Low	NONE
U1041	Lost Communications with Brake/Traction Control System	ABS
U1064	Lost Communications with Body Multiple Control System	NONE

IMPORTANT: Ignition 0 is a switched battery input to the IPC which should be hot whenever the Ignition switch is in the UNLOCK, RUN or CRANK positions. It should be OFF in LOCK or ACCESSORY positions.

Instrument Panel Cluster (IPC) Diagnostic Trouble Code Reference Table

Symptom	Subsection Reference
B1367 - Device Ignition 0 Circuit Low	8C1 - Instrument Panel Cluster (IPC)
U1041 - Lost Communications with Brake/Traction Control System	8A-50 - Data Link Connector (DLC)
U1064 - Lost Communications with Body Multiple Control System	8A-50 - Data Link Connector (DLC)

Instrument Panel Cluster (IPC) System Check


Hot At All Times
Hot In Run, Bulb Test And Start
Hot In Run And Start
IP Fuse Block
RDO BATT 10 A
CLUSTER 10 A
GAUGES 10 A
L7
L5
J7
ORN 340
PNK 1020
PNK 39
A10
A8
A7
Battery
IGN 0
IGN 1
IP Cluster
Ground
Class 2
A9
A6
GRY 1036
L7 C203 (116 Way)
BLK/WHT 451
B6
Body Bussed Electrical Center (BBEC)
B5
G
Splice Pack SP201
A
E8 C1
Underhood Bussed Electrical Center (UBEC)
E7 C2
Ground Distribution 8A-14
G105
2
Data Link Connector (DLC)

5308w3256

Circuit Description

The IPC Monitors the Class 2 messages and compares them to the various inputs from various sensors and gages. The cluster also monitors the Ignition switch position based on Ignition signal inputs. The cluster has a built in microprocessor that performs a self test on power up.

Conditions for Clearing DTCs

- A history Diagnostic Trouble Code (DTC) will clear after 100 consecutive Ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- Assure that the Radio Batt, Cluster, Illumination, and Gauges fuses are OK.
- The IPC performs a self-check on power up. Turn the Ignition Switch to the RUN position and observe the conditions listed in the Cluster Power-up Function Check Table.
- A scan tool reads class 2 messages.
- Using a scan tool, check for DTCs

Test Description

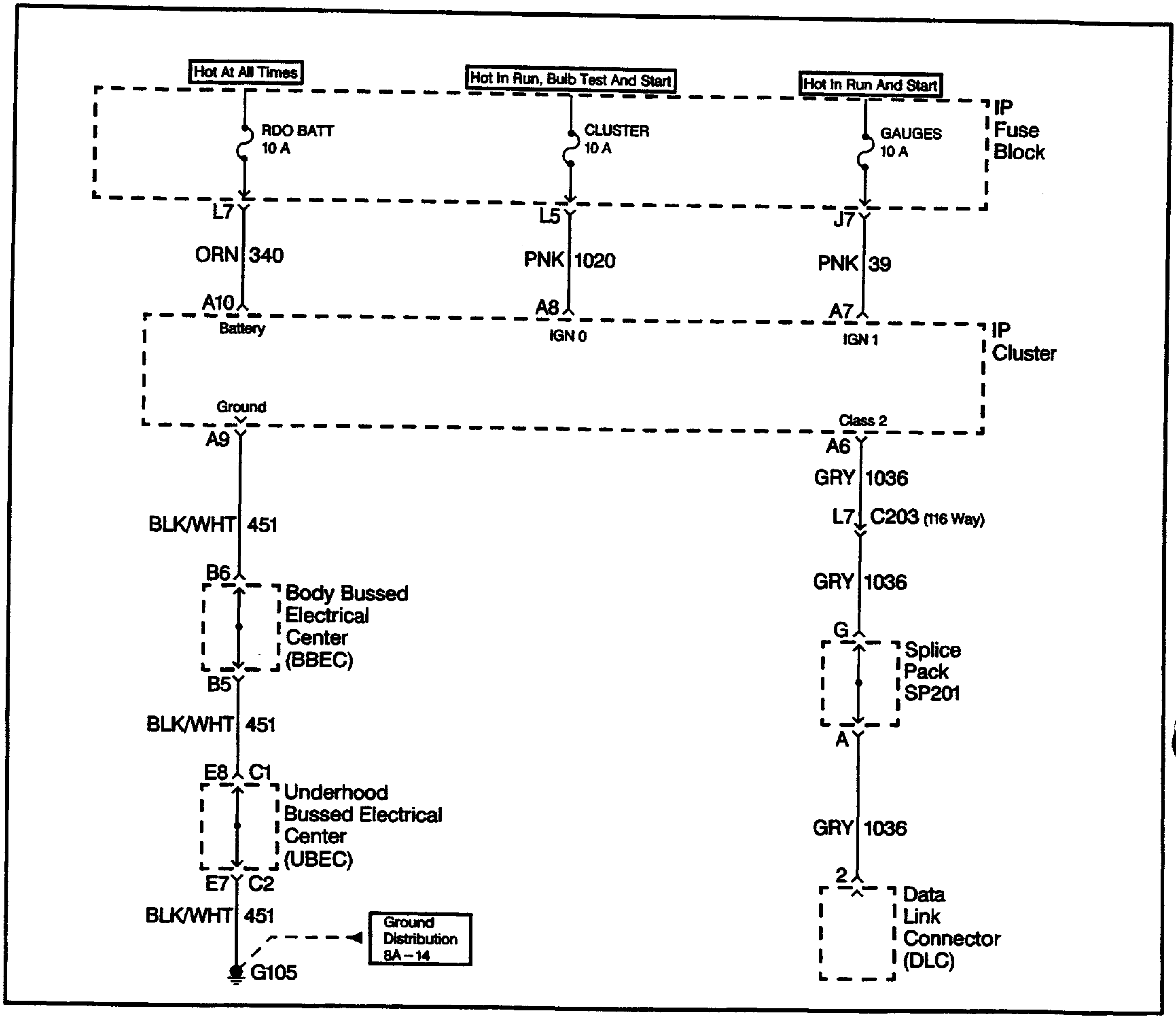
Number(s) below refer to the step number(s) in the *System Check* Table.

1. This step checks the IPC's circuits for power and ground.
2. This step checks the integrity of the class 2 bus and ALL of it's associated modules.
3. This is the IPC self test.
4. This step checks the operation of the PRND.

Instrument Panel Cluster (IPC) System Check

Step	Action	Value(s)	Yes	No
1	Check all IPC power and ground feeds using the Diagnostic Aids section in Entire Instrument Cluster Appears to Have Lost Power table. Is the system diagnostic complete?		Go to Step 2	—
2	Attempt to establish communications with all class 2 modules (i.e. IPC, TBC, ABS, and BPCM) using a scan tool. Does the scan tool communicate with ALL class 2 modules?		Go to Step 3	Go to section 8A-50
3	1. Turn the Ignition switch to the RUN position, DO NOT START the engine and DO NOT move (automatic) transmission shifter from the PARK position. 2. Observe the IPC for the following power-up indications: • Odometer display will perform a 2 sec. segment function test. • ABS - illuminated for 3 seconds • Brake - illuminated for 3 seconds • PRND: (auto trans.) - displays 'P' (park position) • Battery - illuminated • Seat Belt Indicator - ON for 20 seconds then FLASHES for 55 seconds (controlled by TBC) • Service Now - illuminates for 3 seconds • Service Soon - illuminates continuously (controlled by BPCM) • Air Bag - flashes 7 times (controlled by SDM) Note: Refer to Cluster Power-up Function Check Table for more specific telltale bulb status information. Are the power-up indications correct?		Go to Step 4	If condition still exists after completing System Check, Go to Symptom Table
4	1. With the engine running and the brake firmly applied, move the shift lever through each of the shift positions. 2. Observe the PRND indicator. Does the indicator correspond to the shift lever positions?		Go to Step 5	Go to Section 7 Automatic Transmission
5	Using a scan tool, check for DTCs. Are any DTCs present?		Go to applicable DTC table	System Check Complete

DTC B1367 - IPC Ignition 0 Circuit Low


Hot At All Times
Hot In Run, Bulb Test And Start
Hot In Run And Start
RDO BATT 10 A
CLUSTER 10 A
GAUGES 10 A
IP Fuse Block
L7
L5
J7
ORN 340
PNK 1020
PNK 39
A10
A8
A7
Battery
IGN 0
IGN 1
IP Cluster
Ground
Class 2
A9
A6
GRY 1036
L7 C203 (116 Way)
BLK/WHT 451
B6
Body Bussed Electrical Center (BBEC)
B5
G
Splice Pack SP201
A
E8 C1
Underhood Bussed Electrical Center (UBEC)
E7 C2
2
Data Link Connector (DLC)
Ground Distribution 8A-14
G105

5308w3256

Circuit Description

The IPC checks for low Ignition 0 voltage when the engine is running. If Ignition 0 is low, DTC B1367 is set. Ignition 0 is a switched battery input to the IPC which should be high/hot whenever the Ignition switch is in the UNLOCK, RUN or CRANK positions. It should be low in LOCK or ACCESSORY positions.

Conditions for Setting the DTC

- Engine Run Flag (Class 2 message)
- Voltage at pin A8 (PNK wire - Ignition 0) is less than 3 volts.
- The above conditions are met for 1 second or more.

Conditions for Clearing the DTC

- A history DTC will clear after 100 consecutive fault free Ignition cycles.
- History and current DTC(s) can be cleared by using a scan tool.

Diagnostic Aids

- An "Intermittent" problem may be caused by a poor connection, break in the wire insulation exposing the internal wire, or a wire that is broken inside the insulation.
- If the Ignition 0 voltage is low at IPC connector pin A8 and the engine is not running, the IPC odometer and PRND displays will not be illuminated and the IPC will not communicate with the scan tool. The season odometer will display if the tripometer switch is pressed and the IPC will communicate with the scan tool until the tripometer switch is released.
- DTC 1367 could be read by the scan tool as a history code if the fuse has been recently replaced in the 1020 circuit, or an open or short to ground has been repaired in the 1020 circuit.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table

2. This step checks the Ignition 0 circuit to the IPC for intermittent connections.

DTC B1367 - IPC Ignition 0 Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Disconnect the instrument panel cluster (IPC). 2. Check for intermittent connection at pin A8 of the IPC connector or an intermittent open or short to ground in the 1020 circuit Is an intermittent connection present?	—	Go to Step 3	Go to Step 4
3	Repair intermittent connection. Refer to wiring repairs in wiring systems. Is repair complete?	—	Go to Step 4	—
4	Clear the IPC DTCs using a scan tool. Refer to Clearing the Diagnostic Trouble Codes DTC(s). Is action complete?	—	Go to *IPC System Check*	—

IPC Symptom Reference Table

SYMPTOM	PROCEDURE	SECTION
Instrument Cluster appears to have lost power	Perform "Entire Instrument Cluster Appears to Have Lost Power" diagnostic.	8C1-26
State of charge Gauge does not operate properly	Perform "State of Charge Cauge Does Not Operate Properly" diagnostic	8C1-28
Odometer or tripometer does not illuminate when tripometer switch is pressed with ignition in LOCK position	Perform step 1 of the IPC *System Check*. Verify that headlamps are off (with headlamps on, the dimmer could be adjusted to give the impression that the display is not illuminated). Provided *System Check* step 1 passes, replace the IPC.	8C1-19
Odometer does not accumulate mileage.	Perform step 1 of the IPC *System Check*. If step 1 of the IPC *System Check* passed and the speedometer operates correctly, replace the IPC (provided the odometer has not reached 999,999).	8C1-19
Tripometer does not accumulate / retain mileage.	Perform step 1 of the IPC *System Check*. If step 1 of the IPC *System check* passed, the speedometer operates correctly, AND an interruption in power supply has NOT occurred, replace the IPC. NOTE: Low battery voltage will cause the trip odometer to reset.	8C1-19
PRND or Odometer does not perform 2 second segment function check or does not illuminate at all when ignition switch is in RUN	Perform step 1 of the IPC *System Check*. Verify that headlamps are off (with headlamps on, the dimmer could be adjusted to give the impression that the display is not illuminated). If step 1 of the IPC System Check passed and the odometer is not displayed when the Ignition Switch is in the RUN position, replace the IPC.	8C1-19
PRND and Odometer displays do not illuminate when the Ignition Switch is in the Run position, unless the Tripometer switch is pressed.	Perform step 1 of the IPC *System Check*. Provided *System Check* step 1 passed, replace the IPC. Note: An open or short to ground in the 1020 circuit(Ignition 0) to the IPC will result in the PRND and Odometer displays not being illuminated. Also, the IPC will not be able to communicate with the scan tool. If the tripometer is pressed, the season odometer will be displayed and the IPC will communicate with the scan tool until the Tripometer switch is released.	8C1-19
Cannot toggle between Odometer and Tripometer with the Ignition Switch in the Run position.	Perform step 1 of the IPC *System Check*. Provided *System Check* step 1 passed, replace the IPC.	8C1-19
IPC does not illuminate with Park Lamps or Headlamps or illumination does not respond to the Panel Dimmer Switch	Perform step 1 of the IPC *System Check*. Refer to Section 8A-117 Interior Lights Dimming	8C1-19 & 8A-117

IPC Symptom Reference Table (continued)

SYMPTOM	PROCEDURE	SECTION
No gear displayed on PRND	Perform steps 1 & 2 of the IPC *System Check.* Provided the automatic transmission section check has been conducted and passed, place the Ignition switch in RUN (engine not running) and move the gear selector through the range of gears while monitoring the PRND state with the scan tool. If the scan tool data does not accurately indicate the position of the gear selector, the DMCM is not sending the PRND information to the cluster. In this case, refer to the Drive Motor Engine Controls section. If the scan tool data does indicate the position of the gear selector but the gear is not displayed on the cluster, then the cluster should be replaced. **IMPORTANT:** If the cluster displays all gears except PARK or displays PARK but none of the other gears, refer to symptoms below.	8C1-19
PRND displays all gear positions except PARK	Assuming the "No gear displayed on PRND" symptom has already been evaluated, proceed as follows. If the PRND state PARK is returned by the scan tool and no gear is displayed on the PRND, shift the gear selector into any position other than PARK. If the appropriate gear is displayed, a continuity check of the steering column Park switch is required. NOTE: USING A SCAN TOOL TO DETERMINE THE PARK SWITCH STATUS IS NOT SUFFICIENT FOR DETERMINING CONTINUITY.	8C1-29
PRND displays PARK but no other gears	Assuming the No PRND indicator flag symptom has already been evaluated, proceed as follows. Shift the gear selector to first gear. If the PRND state "First" is returned by the scan tool and there is no flag displayed, shift the gear selector into park. If a flag appears, a continuity check of the steering column park switch is required. NOTE: USING A SCAN TOOL TO DETERMINE THE PARK SWITCH STATUS IS NOT SUFFICIENT FOR DETERMINING CONTINUITY.	8C1-29
PRND displays incorrect gear	Perform PRND Indicator Does Not Operate Properly diagnostic.	8C1-29
Battery Park Voltmeter does not operate properly	Perform steps 1 & 2 of the IPC *System Check.* Provided *System Check* passed, perform the "Battery Pack Voltmeter does not operate properly" table.	8C1-30
AIR BAG Telltale does not operate properly	The Air Bag Telltale is located in the IPC but is operated directly by the Inflatable Restraint Sensing and diagnostic Module (SDM). Refer to Section 9J for diagnosis.	9J

IPC Symptom Reference Table (continued)

SYMPTOM	PROCEDURE	SECTION
TEMP Telltale does not operate properly	Use a Scan Tool to command the telltale ON/OFF. If the IPC will turn the telltale ON/OFF, refer to Body Control Systems. Otherwise, replace the IPC.	8A-51
ANTI-LOCK Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check* above. Use a Scan Tool to command the telltale ON/OFF. If the IPC will turn the telltale ON/OFF, refer to Anti Lock Brakes. Otherwise replace the IPC.	8A-44
BATT LIFE Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check*. Use a Scan Tool to command the telltale ON/OFF. If the IPC will turn the telltale ON/OFF, refer to Section 8A-20 Drive Motor Control Schematics. Otherwise, replace the IPC.	8A-20
SEAT BELT Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check*. Use a Scan Tool to command the telltale ON/OFF. If the IPC will turn the telltale ON/OFF, Refer to Body Control Systems. Otherwise, replace the IPC.	8A-51
HIGH BEAM Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check*. Use the scan tool to command the high beam telltale ON/OFF. If the high beam telltale can be commanded ON/OFF with the scan tool, refer to Body Control Systems. If the high beam telltale cannot be commanded ON/OFF with the scan tool, REPLACE the bulb.	8A-51
SERV NOW Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check*. Use a Scan Tool to command the telltale ON/OFF. If the Service Now telltale can be commanded ON/OFF with the scan tool, refer to Body Control Systems. Otherwise, replace the IPC.	8A-51
LEFT TURN SIGNAL Telltale does not operate properly	Perform step 1 of the IPC system check. If step 1 passes, connect a test light between IPC harness connector (cavity B1) and ground. Close the turn signal switch. If the test light illuminates, replace the bulb. Otherwise, refer to Section 8A-110 Exterior Lights.	8A-110

IPC Symptom Reference Table (continued)

SYMPTOM	PROCEDURE	SECTION
RIGHT TURN SIGNAL Telltale does not operate properly	Perform step 1 of the IPC system check. If step 1 passes, connect a test light between IPC harness connector (cavity B11) and ground. Close the turn signal switch. If the test light illuminates, replace the bulb. Otherwise, refer to Section 8A-110 Exterior Lights.	8A-110
BRAKE Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check.* Use a Scan Tool to command the telltale ON/OFF. If the IPC will command the telltale ON/OFF, refer to ABS and/or TBC Systems. Otherwise, replace the IPC.	8A-44
LOW HEATER FUEL Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check.* Use a Scan Tool to command the telltale ON/OFF. If the IPC will command the telltale ON/OFF, refer to HTCM. Otherwise, replace the IPC.	1B
Charge Paddle Present Telltale does not operate properly	Perform steps 1 & 2 of the IPC *System Check.* Use a Scan Tool to command the telltale ON/OFF. If the IPC will command the telltale ON/OFF, refer to Drive Motor Controls. Otherwise, replace the IPC.	8A-51
SERVICE SOON (MIL) Telltale does not operate properly	The Service Soon Telltale is operated directly by the DMCM. Refer to Sections 8A-20 Drive Motor Controls for diagnostics.	8A-20-0
POWER USE Gauge does not operate correctly	Perform steps 1 & 2 of the IPC *System Check.* If the gauge passes these steps, refer to "Power Use Gauge Does Not Operate Properly" diagnostic.	8C1-28
SPEEDOMETER does not operate properly.	Perform steps 1 & 2 of the IPC *System Check.* If the gauge passes these steps, refer to "Speedometer Does Not Operate Properly" diagnostic.	8C1-30
Can not establish Class 2 communication with Scan Tool	Perform IPC *System Check* steps 1 & 2. If the system passes, refer to Lost Communication Diagnostics - Data Link Connection.	8A-50

Diagnostic Aids

1. Refer to the Cluster Power-Up Function Check Table to determine the normal visual indications when the IPC is powered up.
2. CHECK the RADIO BATT, CLUSTER, GAUGES, and ILLUMINATION fuses in the I/P Fuse Block.
3. CHECK the I/P Cluster connector for a good connection.
4. An "Intermittent" problem may be caused by a poor connection, break in the wire insulation exposing the internal wire, or a wire that is broken inside the insulation.

Entire Instrument Cluster Appears To Have Lost Power

Step	Action	Value(s)	Yes	No
1	Was IPC *System Check* performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Connect a test lamp between the PNK (1020) wire at the cluster connector terminal A8, and ground. 2. Turn the Ignition Switch to the RUN position. Does the test lamp turn ON?	Battery positive voltage	Go to Step 4	Go to Step 3
3	1. Inspect the CLUSTER fuse for an open or a poor connection. 2. If the CLUSTER fuse is OK, REPAIR the open in the PNK (1020) circuit between the I/P Fuse Block cavity L5 and the I/P Cluster connector cavity A8. 3. Place the Ignition Switch in the RUN position. Is battery positive voltage present at the PNK (1020) wire, IP Cluster connector cavity A8 ?	Battery positive voltage	Go to Step 4.	—
4	1. Connect a test lamp between the PNK (39) wire at the cluster connector terminal A7, and ground. 2. Turn the Ignition Switch to the RUN position. Does the test lamp turn ON?	Battery positive voltage	Go to *Step 6*	Go to Step 5
5	1. Inspect the GAUGES fuse for an open or a poor connection. 2. If the GAUGES fuse is OK, REPAIR the open in the PNK (39) circuit between the I/P Fuse Block cavity J7 and the I/P Cluster connector cavity A7. 3. Place the Ignition Switch in the RUN position. Is battery positive voltage present at the PNK (39) wire, IP Cluster connector cavity A7 ?	Battery positive voltage	Go to *Step 6*	—
6	1. Connect a test lamp between the GRAY (1220) wire at the cluster connector terminal B2 and ground. 2. Turn the ignition switch to RUN. 3. Turn the headlamp switch to HEADLAMPS and adjust the dimmer switch for full brightness. Does the test lamp turn on?	Battery positive voltage	Go to Step 8	Go to Step 7
7	1. Inspect the ILLUMINATION fuse for an open or poor connection. 2. If the fuse is OK, repair the GRAY (1220) circuit between the I/P fuse block cavity L7 and the I/P cluster connector cavity B2. 3. Place the ignition switch to RUN. 4. Turn the headlamp switch to HEADLAMPS and adjust the dimmer switch for full brightness. Is battery positive voltage present at the GRAY (1220) wire, I/P cluster cavity A7?	Battery positive voltage	Go to Step 8	—

Entire Instrument Cluster Appears To Have Lost Power (continued)

Step	Action	Value(s)	Yes	No
8	Connect a test lamp between the ORN (340) wire at the cluster connector terminal A10, and ground. Does the test lamp turn ON?	Battery positive voltage	Go to Step 10	Go to Step 9
9	1. Inspect the RADIO BATT fuse for an open or a poor connection. 2. If the RADIO BATT fuse is OK, REPAIR the open in the ORN (340) circuit between the I/P Fuse Block cavity C1 and the I/P Cluster connector cavity A10. Is battery positive voltage present at the ORN (340) wire, IP Cluster connector cavity A10?	Battery positive voltage	Go to Step 10	—
10	Connect a test lamp between the ORN (340) wire at the I/P Cluster connector terminal A10, and the BLK/WHT (451) ground wire at terminal A9. Does the test lamp turn ON?	Battery positive voltage	Go to Step 12	Go to Step 11*k*
11	REPAIR the open in the BLK/WHT (451) wire between the I/P Cluster connector terminal A9 and ground. Is the repair complete?	—	Go to *IPC System Check*	—
12	Connect a test lamp between the ORN (340) wire at the I/P cluster connector A10 and the BLK (1050) ground wire at terminal B3. Does the test lamp turn on?	Battery positive voltage	Power and ground OK. Go to *IPC System Check*	Go to Step 13
13	Repair the open in the BLK (1050) wire between the I/P cluster connector terminal B3 and ground. Is the repair complete?		Go to *IPC System Check*	—

State of Charge Gauge Does Not Operate Properly

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Ignition ON. 2. Install a scan tool. 3. Select the State of Charge display on the scan tool. Does the scan tool agree with the expected State of Charge?		Go to Step 3	Go to Step 5
3	Compare the State of Charge display on the scan tool to the State of Charge Value displayed on the Gauge. Are they approximately the same value? (Within 15%)		System OK	Go to Step 4
4	Replace the IP cluster. Refer to *IP cluster replacement.* Is the action complete?		Go to *IPC System Check*	—
5	Check for an input to the IPC cluster at terminal A3. Is there a signal input?	3 - 5 VAC (on RMS scale)	Go to Drive Motor Controls	Go to Step 6
6	Check the following items: 1. The circuit from the IP cluster to the Body Control Interface Module (BCIM) for a short to voltage or ground. 2. The circuit from the IP cluster to the BCIM for an open. 3. All electrical connectors for proper mating. 4. Repair any problem found. Was a problem found and corrected?	—	Go to *IPC System Check*	Go to Drive Motor Controls

Power Use Gauge Does Not Operate Properly

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Ignition ON. 2. Install a scan tool. 3. Select the Power Use display on the scan tool. 4. Compare the Power Use data on the scan tool to the Power Use gauge reading on the cluster. Are the readings on the scan tool and the gauge approximately the same? (Within 25 degrees)		IPC is OK. Refer to Drive Motor Control if temperature is not as expected.	Go to step 6
3	Replace the IPC. Refer to IP cluster replacement. Is the action complete?	—	Go to *IPC System Check*	—

PRND Indicator Does Not Operate Properly

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	The following symptoms are covered in the IPC Symptom Reference Table and should not be diagnosed using this procedure: • PRND displays all gear positions except PARK • PRND displays PARK but no other gears • No gear displayed on PRND Is the problem being diagnosed listed above?		Go to appropriate entry in IPC Symptom Reference Table	Go to Step 3
3	Using a scan tool, command the cluster to display each gear on the PRND display. Does cluster display proper gear when commanded by scan tool?		Go to Step 4	Go to Step 6
4	1. Ignition in RUN position. 2. Move the gear selector through the range of gears while monitoring the PRND state with the scan tool. 3. Compare the scan tool data to the PRND display on the cluster. 4. Compare the transmission position read outs on the scan tool to the IPC PRND displays. Does the PRND display agree with the scan tool data?	—	Go to Step 5	Go to Step 6
5	Does the scan tool data accurately indicate the position of the gear selector?		System OK	DMCM is sending the wrong gear information to the cluster. Diagnose Drive Motor Controls system.
5	Replace the IPC. Refer to *IP cluster replacement*. Is the action complete?	—	Go to *IPC System Check*	—

Battery Pack Voltmeter Does Not Operate Properly

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Ignition ON. 2. Using a scan tool command the volmeter OFF and ON. The gauge should be at or near 220 when commanded OFF and at or near 420 commanded ON. Does the gauge operate properly when commanded with the scan tool?	—	Go to Step 3	Go to Step 4
3	1. Select the volt display on the scan tool. 2. Compare volt display on the scan tool to the amount of charge known to be in the battery. Does the scan tool approximately agree with the known amount of change the battery? (Within 15%)		System OK	Refer to Drive Motor Controls
4	Replace the IPC. Refer to IP cluster replacement. Is the action complete?	—	Go to *IPC System Check*	—

Speedometer Does Not Operate Properly

Step	Action	Value(s)	Yes	No
1	Was the "Instrument Panel Cluster (IPC) *System Check*" performed?	—	Go to Step 2	Go to *IPC System Check*
2	1. Properly support the vehicle so that the wheels are off of the ground. 2. Install a scan tool. 3. Ignition ON, engine running, transmission in gear, wheels spinning. 4. Select the Vehicle Speed display on the scan tool. 5. Compare the Vehicle Speed on the scan tool to the expected speed at which the vehicle is being driven. Speedometer display on the IPC. Does the scan tool agree with the expected vehicle speed?	—	Go to Step 3	Go to Step 5
3	Compare the Vehicle Speed displayed on the scan tool to the speed displayed on the speedometer. Are the speeds approximately the same? (Within 3 MPH)		System OK	Go to Step 4
4	Replace the IP cluster. Refer to IP *cluster replacement.* Is the action complete?	—	Go to *IPC System Check*	—
5	Check for a Speed input to the IPC cluster at terminal A4. Is there a Speed signal input?	3 - 5 VAC (on RMS scale)	Go to Drive Motor Controls	Go to Step 6
6	Check the following items: 1. The DK GRN (389) circuit from the IP cluster to the Drive Motor Control Module for a short to voltage. 2. The DK GRN (389) circuit from the IP cluster to the Drive Motor Control Module for an open. 3. All electrical connectors for proper mating. 4. Repair any problem found. Was a problem found and corrected?	—	Go to *IPC System Check*	Go to Engine Controls

Repair Instructions

NOTICE: The ignition switch should be in the OFF position when connecting or disconnecting the connectors to the IPC. If an excessive current draw is detected refer to the *Parasitic Load test in Section 6, Engine Electrical.*

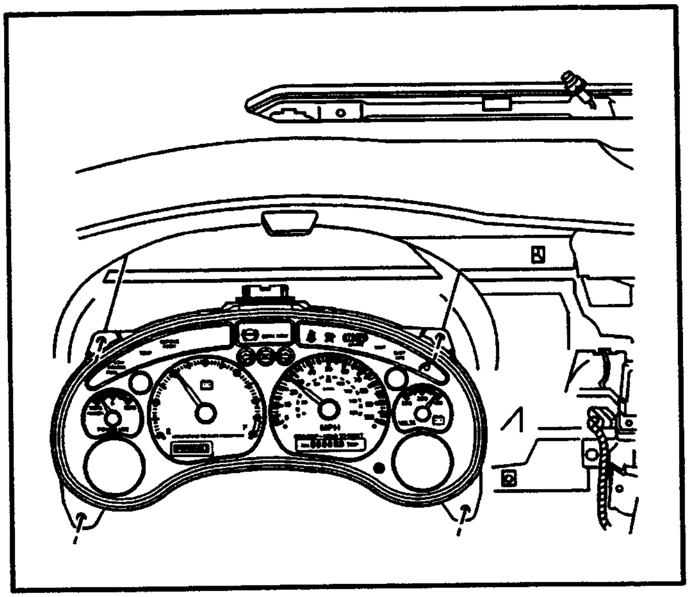
Instrument Panel Cluster (IPC) Replacement

The service of the Instrument Panel Cluster (IPC) may consist of replacing the IPC.

NOTICE: When replacing instrument panel cluster assembly, federal law requires that the odometer reading of the replacement unit be set to register the same mileage as the prior odometer. If the same mileage cannot be set, the law requires that the replacement odometer be set at zero and a label be installed on the driver's door frame to show the previous odometer reading and the date of replacement.

Remove or Disconnect

Instrument Panel Cluster

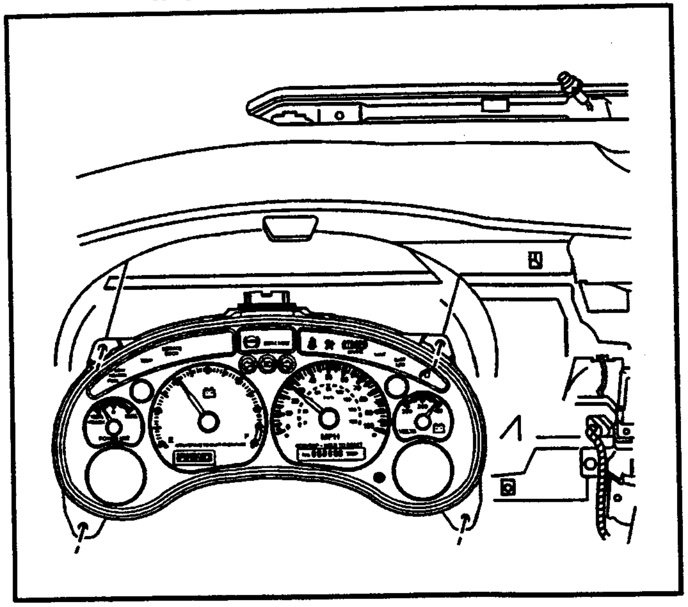


5308w3261

1. Negative battery cable. Refer to *Battery Disconnect Caution in Cautions and Notices.*
2. Instrument panel accessory trim plate. Refer to *Instrument Panel Accessory Trim Plate Replacement in Interior Trim.*
3. Four screws retaining cluster to instrument panel.
4. Electrical connections as necessary.
5. Cluster from instrument panel.

Install or Connect

Instrument Panel Cluster



5308w3261

1. Cluster to the instrument panel. Firmly seat cluster onto the connector.
2. Electrical connections as necessary.
3. Screws.

   Tighten

   - Instrument Panel Cluster screws to 1.9 nm (17 lb in).
4. Instrument panel accessory trim plate. Refer to *Instrument Panel Accessory Trim Plate Replacement in Interior Trim.*
5. Negative battery cable.

Wiring Harness Service

The IPC harness electrically connects, via class 2 communication, to the IPC and other control modules (i.e. TBC, BPCM, and ABS), switches and sensors in the vehicle engine compartment and in the passenger compartment.

Wire harnesses must be replaced with the proper part number. When splicing signal wires into a harness, wires with high temperature insulation must be used.

Because of the low amperage and voltage levels utilized in IPC, the best possible bond shall be made at all splices. Rosin-core solder must be used in IPC wire splices. Refer to *Wire Harness Repair in Electrical Diagnosis.*

Molded-on connectors that are damaged must be replaced. A new connector must be spliced into the harness. Replacement connectors and terminals are listed in Group 8.965 in the Standard Parts Catalog.

Connectors and Terminals

Care must be taken when probing a connector and when replacing terminals. A short between opposite terminals could damage components. Jumper wires must be used between connectors when checking circuits. NEVER probe through Weather-Pack seals. Connector test adapter kit (J 35616-A) is the ONLY recommended method of probing connectors, terminals, and Bussed Electrical Centers. Connector test adapter kit (J 35616-A) contains an assortment of flexible connectors used to probe connectors, terminals, and Bussed Electrical Centers during diagnosis.

Notice: The Probing of electrical circuits without the use of Connector test adapter kit (J 35616-A) could cause damage to electrical components and connectors.

Fuse remover and test tool (BT-8616), or equivalent, is used for removing a fuse and to adapt the fuse holder to a meter for diagnosis.

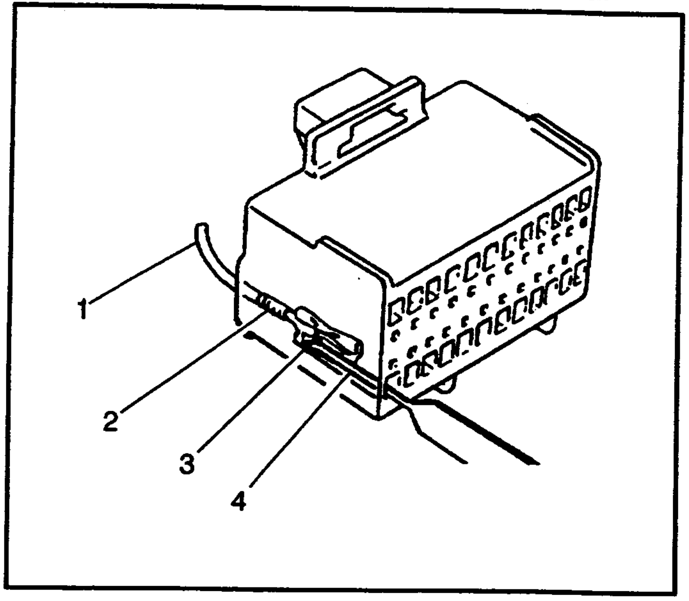
Open circuits may be difficult to locate visually because oxidation or terminal misalignment are hidden by the connectors. Wiggling a connector on a sensor or in the wiring harness may temporarily correct the open circuit. Intermittent problems may be caused by oxidized or loose connections.

Check the type of connector/terminal before making any connector or terminal repair.

Micro-Pack Terminal Removal

Refer to *the below illustration* for the Terminal Removal procedures of a Micro-Pack connector.

Micro-Pack 100 Terminal Removal



TI 00082

Legend

1. Cable.
2. Terminal.
3. Locking tang.
4. Tool J 33095

Basic Knowledge Required

A basic understanding of hand tools is necessary to effectively use this section of the service manual.

Notice: A lack of basic knowledge while performing diagnostic procedures on the IPC could result in incorrect diagnostic or damage IPC components. Do not attempt to diagnose a IPC problem without this basic knowledge. Before using this section of the Service Manual there are some areas that you must be familiar with. Without this basic knowledge, you will have difficulty using the diagnostic procedures in this section.

- Basic Electrical Circuits
  The basic theory of electricity is essential. An understanding of voltage, current and resistance and their relationships to each other will help in the diagnosis of an open or shorted circuit. You must be able to read and understand a schematic wiring diagram.
- Use of Circuit Testing Tools
  You must know how to use jumper wires to bypass components to test circuits. You must be familiar with essential tool J 39200 DMM or equivalent. You must be able to measure voltage, resistance, and current with the DMM you are using.

Aftermarket (Add-On) Electrical And Vacuum Equipment

Aftermarket (Add-On) electrical and vacuum equipment is equipment that has been installed on a vehicle's electrical or vacuum systems after the vehicle leaves the factory. This may also include equipment not connected to the vehicle's electrical system such as portable telephones and radios. No allowances have been made in the vehicle design for this type of equipment.

Notice: Add-on electrical equipment must be connected to the vehicle's electrical system at the battery (power and ground).

Add-on electrical equipment, including telephones and radios, installed to these strict guidelines, may still cause the IPC to malfunction. This may also include equipment not connected to the vehicle's electrical system, such as portable telephones and radios. The first step in diagnosing a IPC problem is to remove add-on electrical equipment from the vehicle. After this is done, if the problem still exists, the problem may be diagnosed in the normal manner.

Visual / Physical Underhood Inspection

One of the most important checks, which must be done before any diagnostic activity, is a careful visual and physical inspection of suspect wiring and components. This can often lead to fixing a malfunction without further steps. An underhood visual and physical inspection can also locate a problem without further steps. Inspect the battery hydrometer (GREEN EYE) to ensure the battery is not discharged. Inspect all electrical circuits for pinches, cuts or disconnects. This visual inspection is very important. It must be done carefully and thoroughly.

Check for proper installation of aftermarket electronic equipment which may affect the integrity of other systems.

The inspection must cover the battery, vacuum hoses, and wiring as follows:

- IPC grounds - dirty, loose and in the wrong location.
- Wiring - loose connections, pinches and cuts.
- BPCM grounds - dirty, loose and in the wrong location.
- Other Class 2 Module grounds.

Diagnostic Information

The Diagnostic Trouble Code (DTC) tables in this section are used to locate a faulty circuit or component through the process of elimination. The IPC performs a continual self diagnosis on certain control functions. A DTC will set when a malfunction is detected by the IPC. The IPC will NOT turn the SERVICE SOON Malfunction Indicator Lamp (MIL) lamp ON. The IPC will turn various Telltales ON which are related to the malfunction detected. Refer to IPC DTC list.

Class 2 Serial Data Communication

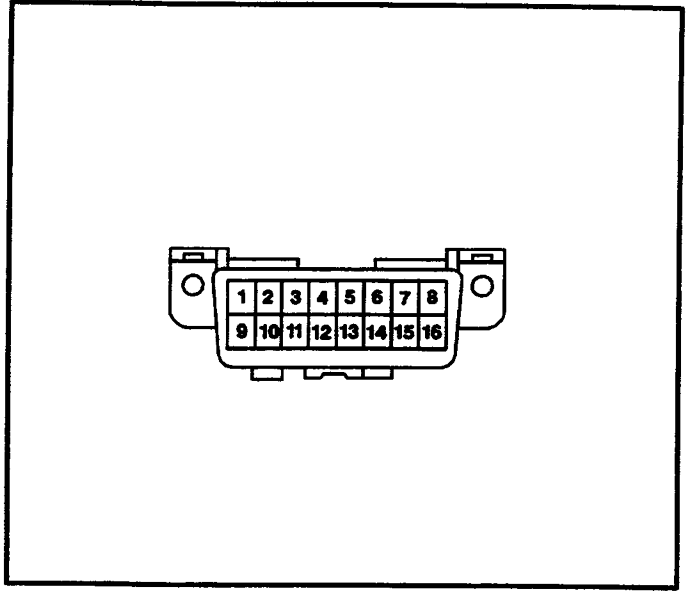
The class 2 network continually monitors various subsystems, (i.e., TBC, IPC, BPCM, and ABS) and operating conditions for possible system malfunctions. By comparing system conditions against standard operating limits, certain circuit and component malfunctions can be detected. A five digit alphanumeric Diagnostic Trouble Code (DTC) is stored in the memory of the IPC. When a malfunction is detected by this self diagnostic system. The DTC(s) can later be retrieved by the service technician with a scan tool. The scan tool can aid the technician in repairing various subsystems.

Data Link Connector (DLC)

The sixteen pin DLC is wired to the Instrument Panel Cluster and is located under the dash panel on the left side. The DLC connector has terminals that are used to connect to a scan tool. Some common uses of the scan tool are listed below:

- Identifying stored Diagnostic Trouble Codes (DTCs).
- Clearing DTCs.
- Performing output control tests.
- Reading Class 2 serial data.
- Reading UART serial data.

Data Link Connector (DLC)



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Scan Tool Diagnosis

The Scan Tool can be used to monitor the communications between the IPC and other Class 2 devices. The scan tool can also display IPC data. The IPC **DATA LIST** display is under the **Instrument Panel Cluster** selection. This list shows the status of the inputs and outputs to the Instrument Panel Cluster. These scan tool values can be very useful in diagnosing the Instrument Panel Cluster.

Scan Tool Information Modes

- On the scan tool, there are three modes available in the **Instrument Panel Cluster** selection. Select **Instrument Panel Cluster**,then **Data List Data**. The following list appears:
- Data
- Inputs
- Outputs

The scan tool allows for the display class 2 values or the state of components commanded by the various systems (i.e. TBC, IPC, BPCM, and ABS). The Tests available are dependent upon the system selected, but may include the following:

- Data (Analog Inputs): Displays analog values as seen by the system.
- Inputs (Digital Inputs): Displays digital values as seen by the system and provides an indication of whether the input has cycled.
- Outputs (Digital Outputs): Cycles digital outputs controlled by the system OFF/ON for 3 seconds each cycle.
- Special Functions (Analog Outputs): Allows for analog outputs of the system to be set at a desired value.
- Clear Diagnostic Trouble Codes: Will erase all DTC(s) stored for the system currently selected (Note: if the malfunction is still present, the DTC may immediately reset).

The Diagnostic Executive

The Diagnostic Executive is a unique segment of software which is designed to coordinate and prioritize the diagnostic procedures as well as define the protocol for recording and displaying their results. The Diagnostic Executive also receives diagnostic test results and records the pass and fail status. The main responsibilities of the Diagnostic Executive are:

- Monitoring the Diagnostic Test Enabling Conditions.
- Recording Pending, Current, and History DTC(s).
- Monitoring and Recording Test Status information.
- Recording pass and fail status of test results

A **diagnostic test** is a series of steps which has a beginning and end. The result of which is a pass or fail reported to the Diagnostic Executive. When a diagnostic test reports a pass result, the Diagnostic Executive records the following data:

- The fault identified by the diagnostic test is not currently active.

When a diagnostic test reports a fail result, the Diagnostic Executive records the following data:

- The fault identified by the diagnostic test is currently active.
- The fault identified has been active since the last 100 ignition cycles or since the codes have been cleared.
- Code supported BIT is enabled.

Diagnostic Trouble Code (DTC) Diagnosis

This section uses diagnostic tables, wiring diagrams and descriptive text to direct you in performing specific tests to locate and repair the problem. The diagnostic table is a step by step procedure to determine the circuit or component that is the source of the problem. The wiring diagrams and text describing the system, test conditions, failure conditions and actions taken when a DTC is set are located on the page facing the diagnostic table.

Diagnostic Trouble Codes (DTC)s, when set, indicate that the IPC has detected a malfunction in a particular circuit or other system. Other system malfunctions are generally, but not exclusively, reported to the IPC via Class 2 data message. The IPC is programmed with routines for internal checks that it follows only under prescribed conditions (called Test Conditions). When these conditions exist, the IPC checks certain circuits or systems for a malfunction. These checks are called failure conditions or conditions for setting the DTC. When these conditions are true, a DTC is set. The IPC may turn a Telltale Malfunction Indicator Lamp (MIL) ON. Refer to the *Applicable DTC Table* for procedures and details.

Reading Diagnostic Trouble Codes DTC(s) With a Scan Tool

The IPC does NOT turn ON the SERVICE SOON Malfunction Indicator Lamp (MIL). The IPC turns various Telltales ON which are related to the malfunction detected. The recommended method for reading DTC(s) stored in memory, is by using a scan tool plugged into the DLC connector located under the instrument panel on the left side. Follow the scan tool instructions supplied by the tool manufacturer. The DTC(s) will be stored in the memory of the IPC as a Current or a History DTC.

Current Codes

When the IPC determines that the test conditions and failure conditions for a particular DTC are true and it is during the current ignition cycle, it sets the code as a Current DTC. All DTC(s) remain current until the next fault free ignition cycle and the IPC finds the test conditions are true and the failure conditions are false. The Current code then will become a History code only.

History Codes

When a DTC reports a failure and the failure was not in the current ignition cycle it will be stored as a History Code. The IPC performs internal diagnostic tests to acknowledge that the related systems have reported a pass or fail condition. Each diagnostic test that fails is recorded in the IPC memory. The IPC memory can be accessed with a scan tool to determine which DTC circuit was at fault.

A history DTC can be cleared (for any diagnostic test) as follows:

- Completing 100 subsequent ignition cycles with no diagnostic test reporting a fail.
- Using a scan tool.
- Disconnecting the battery.
- Disconnecting the IPC connector.

NOTICE: Disconnecting the battery or disconnecting the IPC connector will clear all Current and History IPC DTC(s).

After Diagnosis is Complete

After diagnosing a problem, in addition to repairing the discovered malfunction, clear any DTC(s) set and verify proper operation. To verify proper operation, you must duplicate the conditions when the customer's complaint occurred or if a DTC was set, you must duplicate the test conditions for that DTC (listed on the facing page of the Diagnostic Trouble Code table) and refer to conditions for setting the DTC. The DTC should not re-set after the repair has been made.

Clearing Diagnostic Trouble Codes DTC(s)

A DTC can be cleared from the memory of the IPC by disconnecting the battery or by disconnecting the IPC electrical connector. A DTC can be cleared from the memory of the IPC by using the Scan tool or after 100 concurrent ignition cycles have occurred without the fault reoccurring. Clearing DTC(s) from the IPC memory is necessary after a repair has been made or to check if a malfunction will occur again. If the fault still exists the DTC will re-set after clearing DTC(s).

Tools Needed to Service the System

You must know how to use jumper wires to bypass components to test circuits. You must be familiar with the Digital Multimeter (DMM). You must be able to measure voltage, resistance, and current with an DMM.

System diagnosis requires a scan tool, test light, DMM with 10 Meg-ohms impedance (J 39200), Connector test adapter kit (J 35616-A) and jumper wires. A test light or a voltmeter must be used only when specified in the procedures. Refer to *Special Tools in this Section.*

Instrument Panel Cluster Description and Operation

Instrument Panel Cluster (IPC)

The standard instrument cluster contains a microprocessor. The Instrument Panel Cluster (IPC) micro processor communicates with other controllers in the vehicle over the Class 2 Serial Data Bus. The information passed over the Class 2 Bus, along with direct external connections to other controllers and devices, provides the inputs which are used to operate all the gauges and illuminated displays in the cluster. Some displays and gauges are operated directly by external sources (devices or controllers) and others are under software control of the IPC. As the IPC micro processor runs its operating software, it continuously processes Class 2 data to determine the correct values and states to display. The operation of each of the gauges and displays is described below.

NOTICE: When replacing instrument panel cluster assembly, federal law requires that the odometer reading of the replacement unit be set to register the same mileage as the prior odometer. If the same mileage cannot be set, the law requires that the replacement odometer be set at zero and a label be installed on the driver's door frame to show the previous odometer reading and the date of replacement.

Instrument Panel Cluster Service Precautions

Do not use a test light to diagnose the IPC electrical systems unless specifically instructed by diagnostic procedures. Use the connector test adapter kit (J 35616) when diagnostic procedures require probing of connectors. Refer to *Special Tools* in this section.

The Instrument Panel Cluster (IPC) will withstand normal current draws associated with vehicle operations. Avoid overloading any circuit. When testing for opens or shorts, do not ground or apply voltage to the IPC circuits unless instructed to do so. These circuits may only be tested using a Digital Multimeter (DMM) J 39200 or equivalent. Electrical circuits should be tested with a DMM, while the IPC connector remains connected to the IPC or the recommended breakout box. Never remove or apply voltage to the IPC with the key in the RUN position. Before removing or connecting battery cables, fuses or connectors always turn the key to the LOCK position. Whenever a IPC removal and replacement is performed, follow the removal and replacement instructions.

Segment Check

The purpose of illuminating the IPC LED and Telltale displays on power up is to verify that segments of the LED and Telltale displays are working. The turn signal indicators do not turn ON during this check. Further diagnosis should not be attempted unless all segments appear, as this could lead to misdiagnosis. If any portions or segments of the IPC displays are inoperative, the IPC must diagnosed first. Refer to the *Instrument Panel Cluster (IPC) System Check* Table or the *Cluster Symptom Reference Table*. Refer to Section 8C the *Operation of all Telltales and Gauges.*

Special Tools and Equipment

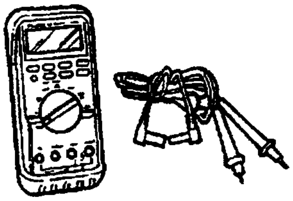
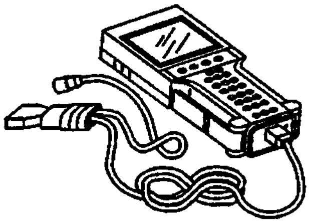
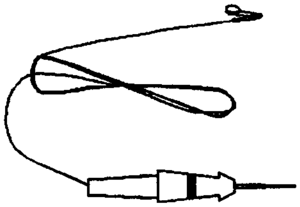
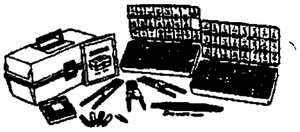
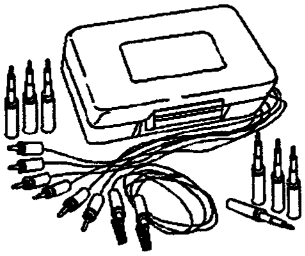
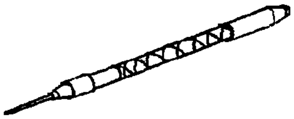
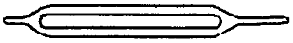
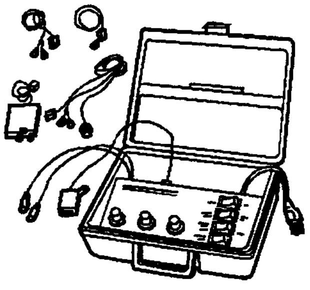
Illustration	Part No. /Description
	J 39200 Digital Multimeter
	7000081 Scan Tool
	J 34142–B 12 Volt Test Light
	J 38125–A Packard Terminal Repair Kit
	J 35616–A Connector Test Adapter Kit
	J 35689–A Metri–Pack Terminal Remover

Illustration	Part No. /Description
	J 33095 Control Module Connector Terminal Remover
	J 33431-B Signal Generator and Instrument Panel Cluster Tester

SECTION 8D

Truck Body Control Module (TBC)

Typical Scan Tool Data Values

Use the *Typical Scan Tool Data Values* listed in this section for comparison after the TBC Diagnostic System Check and finding the on board diagnostics are functioning properly with no diagnostic trouble codes displayed.

The *Typical Scan Tool Data Values* are an average of displayed values recorded from normally operating vehicles. The Typical Scan Tool Data Values are an average of displays are intended to represent what a normally functioning system would display. The values you get may vary due to a low battery charge or other reasons. But they should be very close.

Notice: Do not use a scan tool that displays faulty data. Report the problem to the manufacturer. The use of a faulty scan tool can result in misdiagnosis and unnecessary parts replacement.

Use only the parameters listed in the tables for diagnosis. If a scan tool reads other parameters, the values are not recommended for use in diagnosis. For more description on the scan tool Typical Data Values and the use of the scan tool in order to diagnosis TBC inputs, refer to the *applicable diagnosis table*. If all values are within the range illustrated, Refer to *Diagnostic Aids* located in the Appl*icable Diagnostic Trouble Code Table and the Symptom Subsection References Table* in this section.

Typical Scan Tool Data Display

Module Information 1

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
Module Part Number	NUMERIC	16XXXXXX (Varies with Vehicle)
Manufactures Enable Counter	0-255	0
Software Part Number	NUMERIC	16XXXXXX (Varies with Vehicle)
Software Design Suffix	Two Letters	AA-ZZ (Varies with Vehicle)

Typical Scan Tool Data Display

Module Information 2

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
RAP Calibration Number	NUMERIC	16XXXXXX (Varies with Vehicle)
RAP Suffix	Two Letters	AA-ZZ (Varies with Vehicle)
Lighting Calibration Number	NUMERIC	16XXXXXX (Varies with Vehicle)
Lighting Suffix	Two Letters	AA-ZZ (Varies with Vehicle)
Reminder Calibration Number	NUMERIC	16XXXXXX (Varies with Vehicle)
Reminder Suffix	Two Letters	AA-ZZ (Varies with Vehicle)

Typical Scan Tool Data Display

Data

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
Dimming Potentiometer	Volts	0.1 volts - 12.2 Volts (Varies)
Battery Voltage	Volts	12.2 volts - 14.7 volts (Varies)
Ambient Light Sensor	Volts	4.7 Volts = Maximum Light 2.2 Volts = Dark to Light Threshold 1.3 Volts = Light to Dark Threshold 0.2 Volts = Maximum Dark
Ambient Light	ACTIVE / INACTIVE	LIGHT (when the TBC is in the Light state)
Dusk	YES / NO	YES (When in the Dusk state)
High Beam Input	Volts	DRL Beams = 6.6 Volts Low Beams = 13.2 Volts High Beams = 1.2 Volts (Varies with Vehicle)
Vehicle Speed	MPH and km/h	Varies with Vehicle Speed
Inadvertent Power Timer	SECONDS	1216 Seconds
RAP Timer	SECONDS	1198 Seconds
Courtesy Lamp Timer	SECONDS	40 Seconds

Typical Scan Tool Data Display

Input 1

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
Ignition 1	ACTIVE / INACTIVE	ACTIVE
Ignition 3	ACTIVE / INACTIVE	ACTIVE
Ignition Power Mode	OFF / RUN / CRANK / UNKNOWN	RUN
Driver Door Jamb Switch	ACTIVE / INACTIVE	INACTIVE
Passenger Door Jamb Switch	ACTIVE / INACTIVE	INACTIVE
Key In Ignition	YES / NO	YES (When Key is IN the Ignition Switch)
Seat Belt Buckled	YES / NO	YES (When the Drivers Seat Belt is BUCKLED)
Park Brake Switch	SET / RELEASED	RELEASED (When the Park Brake is not SET)
RAP Relay Feedback	ON / OFF	ON (When the RAP relay is ON)
Horn Relay Input	ACTIVE / INACTIVE	INACTIVE

Typical Scan Tool Data Display

Input 2

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
Interior Lamp Request	ACTIVE / INACTIVE	ACTIVE (When an Interior Lamp request is made and the Inadvertent Power Relay is OFF)
Head Lamp Request Switch	ACTIVE / INACTIVE	ACTIVE (When in the MANUAL Head Lamp position) INACTIVE (When in the AUTO Head Lamp position)
Head Lamp Relay Feedback	ON / OFF	OFF
High Beam Switch	ON / OFF	OFF
Park Lamps	ON / OFF	OFF
Daytime Running Lamps	ACTIVE / INACTIVE	ACTIVE (When in the DRL are ON)
Left Turn Signal	ON / OFF	OFF
Right Turn Signal	ON / OFF	OFF
Dome Lamp Switch	ON / OFF	OFF
Dome Override Switch	ON / OFF	OFF
Dim Pot Input	ACTIVE / INACTIVE	INACTIVE
Courtesy Lamp Relay	ON / OFF	OFF
Auto Head Lamps Enabled	YES / NO	YES (When the TBC is requesting the Auto Head Lamps ON)
Auto Head Lamps	ACTIVE / INACTIVE	ACTIVE (When in the Auto Head Lamps are ON)

Typical Scan Tool Data Display

Outputs

Ignition Switch in the RUN position/Vehicle in PARK /Head Lamps in AUTO Position		
Scan Tool Parameter	**Units Displayed**	**Typical Data Value**
Chime	None / Head Lamp / Turn Signal / Key In Ignition / Device Control	None
Interior Lighting Mode	None / Interior / Illuminated Entry / Exit Lighting / Remote Illuminated	Interior
Inadvertent Power Relay	ON / OFF	ON
RAP Relay	ON / OFF	ON
Head Lamp Power Relay	ON / OFF	ON (When in the MANUAL Head Lamp position) OFF (When in the AUTO Head Lamp position and in the Light State)
DRL Relay	ON / OFF	ON
Park Lamp Relay	ON / OFF	OFF
Courtesy Lamp Relay	ON / OFF	OFF
Dimming	ACTIVE / INACTIVE	INACTIVE (When The Park Lamps are OFF)
Horn Relay	ON / OFF	OFF

Typical Scan Tool Data Definitions

The Typical scan tool readings of Body Control Module data will assist in diagnosing a problem. Scan tool data displays can be viewed while the vehicle is being driven.

- The *Typical Scan Tool Data Definitions* represent general information displayed on the scan tool regarding, Truck Body Control Module functions, ignition inputs, and basic operating conditions.

The data Messages and Menu Headings displayed on the scan tool are as follows:

Module Information 1

Module Part Number - Range: 16XXXXXX

This information refers to the Part number assigned to the TBC currently in the vehicle.

Manufacturers Enable Counter - Range: 0 - 255

This information refers to the actual value for the Manufacturers Enable Counter (MEC) in the TBC. This information is for assembly plant use only.

Software Part Number - Range: 16XXXXXX

This information refers to the software ID (software identification number) in the TBC.

Software Design Suffix - Range: AA - ZZ

This information refers to the version of the Software Part Number in the TBC.

Module Information 2

RAP Calibration Number - Range: 16XXXXXX

This information refers to the RAP calibration Part Number in the TBC.

RAP Suffix - Range: AA - ZZ

This information refers to the RAP Identification Number in the TBC.

Lighting Calibration Number - Range: 16XXXXXX

This information refers to the Lighting Configuration Calibration Part Number in the TBC.

Lighting Suffix - Range: AA - ZZ

This information refers to the Lighting Configuration Identification Number in the TBC.

Reminder Calibration Number - Range: 16XXXXXX

This information refers to the Reminder Warning Calibration Part Number in the TBC.

Reminder Suffix - Range: AA - ZZ

This information refers to the Reminder Warning Identification Number in the TBC.

Data

Dimming Potentiometer - Range: 0.0 volts - 18.0 volts.

The voltage value displayed indicates the position of the Dome Lamp Switch (thumb wheel). Zero (0) volts will be displayed when the Head Lamp switch is in the AUTO position and the Daytime Running Lamps are OFF. 10.5 volts will be displayed when either the Park Lamps or Head Lamps are turned ON and the Dome Lamp Switch is in the FULL BRIGHT position (thumb wheel turned completely up just before the detent). 0.1 volts will be displayed if the Park Lamps or Head Lamps are turned ON and the dimmer switch is in the FULL DIM position (thumbwheel turned completely down). The Dimming Potentiometer voltage will change as the Dome lamp Switch is moved between FULL BRIGHT and FULL DIM. The voltage value displayed should vary between 0.1 volts and 12.7 volts depending on the position of the Dome Lamp Switch.

Battery Voltage - Range: 0 - 18.0 Volts

The voltage value displayed refers to the battery system voltage measured by the TBC.

Ambient Light Sensor - Range: 0 - 5.0 Volts

The displayed voltage value refers to the amount of ambient light level as measured by the Light Sensor. This information is used by the TBC for operation of the Automatic Head Lamp feature and the Daytime Running Lamps (DRL) feature. The TBC supplies 5 volts to the Ambient Light Photocell Sensor and receives a return signal voltage from the Ambient Light Photocell Sensor on the return signal circuit. The TBC monitors the signal return circuit. The Ambient Light Sensor's internal resistance changes with different levels of ambient light. In LIGHT ambient conditions, the resistance is low. In DARK ambient conditions, the resistance is high. When the Ambient Light Sensor is exposed to bright ambient light (low resistance) a high voltage (2.2 volts to 4.7 volts) is present on the return circuit, the TBC interprets this as **LIGHT**. As the Ambient Light Sensor is exposed to Dark ambient light (internal resistance increases), the return signal voltage decreases and the TBC interprets this as **DARK** (0.2 volts to 1.3 volts). If there is an open or a short to ground in the Ambient Light Sensor circuit it will read about 0.0 volts and the TBC will default into a **DARK** state and turn the Head Lamps ON.

If the Head Lamps are set to the AUTO position while in the LIGHT state the and the Ambient Light Level conditions change to DARK for 15 seconds then the TBC will turn the Head Lamps ON.

If the Head Lamps are set to the AUTO position while in the DARK state the and the Ambient Light Level conditions change to LIGHT for 20 seconds then the TBC will turn the Head Lamps OFF.

Ambient Light - Range: Light / Dark

The displayed value refers to the amount of ambient light level calculated by the TBC using the Light Sensor. This information is used by the TBC for operation of the Automatic Head Lamp feature and the Daytime Running Lamps (DRL) feature. The TBC supplies 5 volts to the Ambient Light Photocell Sensor and receives a return signal voltage from the Ambient Light Photocell Sensor on the return signal circuit. If there is an open or a short to ground in the Ambient Light Sensor circuit the scan tool will display **DARK** and the TBC will default into a **DARK** state and turn the Head Lamps ON.

If the Head Lamps are set to the AUTO position while in the LIGHT state the and the Ambient Light Level conditions change to DARK for 15 seconds then the TBC will turn the Head Lamps ON.

If the Head Lamps are set to the AUTO position while in the DARK state the and the Ambient Light Level conditions change to LIGHT for 20 seconds then the TBC will turn the Head Lamps OFF.

Dusk - YES / NO

The displayed value refers to the dimming signal output from the TBC. This information is used by the TBC for operation of the Automatic Head Lamp feature and the Daytime Running Lamps (DRL) feature. Dusk is displayed whenever the Park lamps are ON.

High Beam Input - Range: 0.0 - 18.0 Volts

The TBC uses this input in determining the state of the High Beam Head Lamps by measuring the circuit voltage at a point between both High Beam Head Lamps and the Beam Selector Switch. The High Beam input voltage will vary depending on the state of the Head Lamps as follows:

Head Lamps State	High Beam Input voltage
DRL Beams ON	6.6 volts
Low Beams ON	13.2 volts
High Beams ON	1.2 volts

Vehicle Speed - Range: 0 - 205 km/h

The TBC uses this data for determining how fast the vehicle traveling. The TBC uses this data for the Turn Signal Reminder Feature.

Inadvertent Power Timer - Range: 0- 1216 Seconds

TBC uses this feature to protect the battery against inadvertent battery rundown caused by devices attached to the Courtesy Lamp circuit. If the customer accidentally left ON the Dome/Courtesy, Underhood or Glove Box Lamp the TBC will turn them OFF after about 20 minutes (1216 seconds). This is done by turning OFF the Inadvertent Power Relay. The Inadvertent Power Relay supplies power to the Courtesy Lamp circuit when the Ignition is in the OFF position. The number of seconds displayed refers to the amount of time left before the TBC turns the relay OFF.

RAP Timer - Range: 0- 1196 Seconds

TBC uses this feature to control the devices attached to the Retained Accessory Power (RAP) circuit. This feature will allow the operation of Radio, for up to 20 minutes after the ignition key is turned OFF and before any door is opened. Once any door is opened or after 20 minutes (1196 seconds) the TBC opens the ground circuit for the Retained Accessory Power (RAP) Relay. This will turn OFF the Radio. The number of seconds displayed refers to the amount of time left before the TBC will turn OFF the Retained Accessory Power (RAP) Relay.

The TBC uses this data to allow for control of the power to the Retained Accessory Power (RAP) circuit.

Courtesy Lamp Timer - Range: 0- 40 Seconds

TBC uses this feature to control the devices attached to the Illuminated Entry, and Exit Lighting circuits. ILLUMINATED ENTRY - When entering the vehicle, the Courtesy Lamps will come ON and stay ON for 15 seconds or until the ignition is turned ON. EXIT LIGHTING - When the key is removed from the ignition, the Courtesy Lamps will come ON and stay ON for 40 seconds. The number of seconds displayed refers to the amount of time left before the TBC turns the Courtesy Lamp Relay OFF.

Input 1

Ignition 1 - Range: ACTIVE / INACTIVE

The TBC uses this data to determine the position of the ignition switch. ACTIVE is displayed when the ignition switch is in the RUN or CRANK position. INACTIVE is displayed when the ignition switch is not in the RUN or CRANK position.

Ignition 3 - Range: ACTIVE / INACTIVE

The TBC uses this data to determine the position of the ignition switch. ACTIVE is displayed when the ignition switch is in the RUN position only. INACTIVE is displayed when the switch is not in the RUN position.

Ignition Power Mode - Range: OFF / RUN / CRANK / UNKNOWN

The TBC uses this data to determine the position of the ignition switch. OFF is displayed when the ignition switch is in the OFF or ACCESSORY positions. RUN is displayed when the switch is in the RUN position. CRANK is displayed when the ignition switch is in the CRANK position. UNKNOWN is displayed when the TBC can not determine the position of the ignition switch (i.e. between the OFF and the RUN position).

Driver Door Jamb Switch - Range: ACTIVE / INACTIVE

This information refers to the position of the Driver's Door. INACTIVE is displayed when the Driver's Door is closed (switch plunger is pushed in). ACTIVE is displayed when the Driver's Door is open (switch plunger is out).

Passenger Door Jamb Switch - Range: ACTIVE / INACTIVE

This information refers to the position of the Passenger Door. ACTIVE is displayed when the Passenger Door is not completely closed. INACTIVE is displayed when the Passenger Door is completely closed.

Key In Ignition - Range: YES / NO

This information refers to the position of the Ignition Key in the ignition switch. YES is displayed when the Ignition Key is completely inserted in the Ignition Switch Cylinder. NO is displayed when the Ignition Key is not completely inserted in the Ignition Switch Cylinder. The TBC uses this data in controlling the operation of the Key In Ignition warning chime feature.

Seat Belt Buckled - Range: YES / NO

This information refers to the position of the Driver's Seat Belt Buckle. YES is displayed when the Driver's Seat Belt Buckle is buckled (switch is opened). NO is displayed when Driver's Seat Belt Buckle is not buckled (switch closed). This data is used by the TBC in controlling the operation of the Seat Belt Warning Chime.

Park Brake Switch - Range: SET / RELEASED

This information refers to the position of the Park Brake Pedal. SET is displayed when the Parking Brake is depressed (switch closed). RELEASED is displayed when the Parking Brake is not depressed (switch opened). The TBC uses this data in controlling the operation of the Parking Brake ON Warning Light feature and in the operation of the DRL system.

RAP Relay Feedback - Range: ON / OFF

This information refers to the operation of the Retained Accessory Power (RAP) circuit. ON is displayed whenever the TBC is turning ON the RAP Relay, allowing operation of the Radio with the Ignition Key removed (or in the OFF position) with all doors closed. OFF is displayed when the TBC is not turning ON the RAP relay and not allowing operation of the Radio with the Ignition Key removed (or in the OFF position) with all doors closed.

Horn Relay Input - Range: ACTIVE / INACTIVE

This information refers to the Horn operation. ACTIVE is displayed when the TBC senses that the Horn Relay Coil circuit is being grounded and the horns are being commanded to sound. INACTIVE is displayed when the TBC does not sense the Horn Relay Coil circuit is being grounded and the horns are not being commanded to sound.

Input 2

Interior Lamp Request - Range: ACTIVE / INACTIVE

This information refers to the Interior Lamp Request Circuit. ACTIVE is displayed momentarily when the an Interior Lamp is requested ON by the customer and the Inadvertent Power Relay is OFF. INACTIVE is displayed whenever the Inadvertent Power Relay is ON.

Head Lamp Request Switch - Range: ACTIVE / INACTIVE

The TBC uses this input to determine the position of the Head Lamp switch. ACTIVE is displayed when the Head Lamp Switch is in the HEAD LAMP position. INACTIVE is displayed when the Head Lamp Switch is not in the HEAD LAMP position.

Head Lamp Relay Feedback - Range: ON / OFF

The TBC uses this input to determine if the Head Lamps are ON or OFF by checking if current is present on the Head Lamp Circuit. The TBC monitors circuit 352 to determine if the Head Lamp Power Relay is energized. ON is displayed when the TBC has received a voltage input on the circuit between the Head Lamp Switch and the Head Lamp Power Relay Coil, indicating to the TBC that the Head Lamps are ON. OFF is displayed when the TBC does not receive a voltage signal on the circuit between the Head Lamp Switch and the Head Lamp Power Relay Coil, indicating to the TBC that the Head Lamps are OFF.

High Beam Switch - Range: ON / OFF

The TBC uses this input to determine if the High Beam Head Lamps are ON by checking the voltage on circuit 524 between both High Beam Head Lamps and the High / Low Beam Selector Switch.

Park Lamps - Range: ON / OFF

The TBC monitors the voltage on the Park Lamp Circuit (2409) to determine if the PARK Lamps are ON. The scan tool will display ON when the TBC turns the Park Lamps ON or when the Head Lamp Switch turns the Park Lamps ON. OFF is displayed when the Park Lamps are not commanded ON by the Park Lamp Switch or by the TBC.

Daytime Running Lamps - Range: ON / OFF

The TBC monitors the state of the Daytime Running Lamps to determine if the Daytime Running Lamps Lamps are ON. The scan tool will display Active when the TBC commands the Daytime Running Lamps ON. Inactive is displayed when the Daytime Running Lamps are not commanded ON by the TBC.

Left Turn Signal - Range: ON / OFF

The TBC uses this input to determine the state of the Left Turn Signal. ON is displayed when the Left Turn Signal switch is engaged, commanding the Left Turn Signal Lamps to be illuminated. OFF is displayed when the Left Turn Signal Switch is not engaged or the Turn Signal Lamps are not illuminated. The TBC monitors the Vehicle Speed input for activation of the Turn Signal Reminder chime feature. The scan tool display will alternate between ON and OFF as the turn signal flashes.

Right Turn Signal - Range: ON / OFF

The TBC uses this input to determine the state of the Right Turn Signal. ON is displayed when the Right Turn Signal switch is engaged, commanding the Right Turn Signal Lamps to be illuminated. OFF is displayed when the Right Turn Signal switch is not engaged or the turn signal lamps are not illuminated. The TBC monitors the Vehicle Speed input for activation of the Turn Signal Reminder Chime feature. The scan tool display will alternate between ON and OFF as the turn signal flashes.

Dome Lamp Switch - Range: ON / OFF

The TBC uses this input in determining if the Dome Lamp Switch (thumb wheel) is requesting the interior lights ON. ON is displayed if the Dome Lamp Switch is requested the TBC to turn the interior lights ON (full up position past the detent). OFF is displayed when the Dome Lamp Switch is not requesting the TBC to turn the interior lights ON (not in the full up position past the detent).

Dome Override Switch - Range: ON / OFF

The TBC uses this input from the Dome Override Switch, Located by the Head Lamp switch, to allow or to defeat the Interior lighting when the door is opened. ON is displayed if the Dome Override switch is overriding the Interior lighting. OFF is displayed if the Dome Override switch is allowing the Interior lights to turn ON when any door is opened or if the Lift Glass is opened (if equipped).

Dim Pot Input - Range: ACTIVE / INACTIVE

The TBC uses this input to determine the position of the Dome Lamp Switch (thumb wheel) when the Park Lamps are ON. ACTIVE is displayed when the Dome Lamp Switch is in not in the FULL DOWN position and the Park Lamps are ON. INACTIVE is displayed when the Dome Lamp Switch is turned to the FULL Down position (dash lights OFF) and the Park Lamps are ON. If the Dome Lamp Switch (thumbwheel) is in the FULL DOWN position (MAX DIM) and the Park Lamps are Turned ON manually and the Ignition Key is removed the Head Lamp Reminder chime will not sound.

Courtesy Lamp Relay - Range: ON / OFF

The TBC uses this input to determine the state of the Courtesy Lamp Relay. ON is displayed when the TBC is commanding the Courtesy Lamps ON by providing a ground for the Courtesy Lamp Relay Coil. OFF is displayed when the TBC is not commanding the Courtesy Lamps ON by not providing a ground for the Courtesy Lamp Relay Coil.

Auto Head Lamps Enabled - Range: YES / NO

The output refers to the TBC commanded state of the for the Auto Head Lamp feature. YES is displayed when the Auto Head Lamps are commanded ON by the TBC. NO is displayed when the when the Auto Head Lamps are commanded OFF by the TBC.

Auto Head Lamps - Range: ACTIVE / INACTIVE

The TBC uses this input to determine if the Auto Head Lamp are ON. ACTIVE is displayed when the Auto Head Lamps are ON. INACTIVE is displayed when the when the Auto Head Lamps are OFF.

Outputs

Chime - Range: NONE / HEAD LAMP / KEY IN IGNITION / SEAT BELT / TURN SIGNAL

This output refers to the commanded state of the audible chime. NONE is displayed when no audible chime sound is commanded. HEAD LAMP is displayed when the chime is commanded ON (audible) by the Head Lamp ON Reminder feature. KEY IN IGNITION is displayed when the chime is commanded ON (audible) by the KEY IN IGNITION Reminder and the DRIVERS DOOR OPEN Reminder feature. SEAT BELT is displayed when the chime is commanded ON (audible) by the Driver's Seat Belt not buckled Reminder feature. TURN SIGNAL is displayed when the chime is commanded ON (audible) by the TURN SIGNAL ON Reminder feature (ON for more than 0.75 OF a mile).

Interior Lighting Mode - Range: NONE / INTERIOR / EXIT LIGHTING

This output displays the name of the feature which commanded the interior lights ON. None is displayed when the interior lights are not commanded ON. INTERIOR is displayed when the interior lights are commanded ON by the Dome Lamp switch. EXIT LIGHTING will be displayed when the mode commands the interior lighting to turn ON.

Inadvertent Power Relay - Range: ON / OFF

This TBC output refers to the commanded state of the Inadvertent Power Relay Coil. ON is displayed when TBC is commanding the Inadvertent Power Relay Coil to be energized. This allows the relay to power up the Courtesy Lamp Relay, Underhood Lamp, and Glove Box Lamp. OFF is displayed when the TBC is not commanding the Inadvertent Power Relay Coil ON. This will not allow current to the Courtesy Lamp Relay, Underhood Lamp, and the Glove Box Lamp.

RAP Relay - Range: ON / OFF

This output refers to the commanded state of the Retained Accessory Power (RAP) Relay Coil. ON is displayed when the TBC is commanding the Retained Accessory Power (RAP) Relay Coil to be energized. This allows the relay to power up the Radio, with the Ignition Key removed or in the OFF position with all doors closed. OFF is displayed when the TBC is commanding the Retained Accessory Power (RAP) Relay Coil OFF.

Head Lamp Power Relay - Range: ON / OFF

This output refers to the commanded state of the Head Lamp Power Relay Coil. ON is displayed when the TBC is commanding the Head Lamp Power Relay Coil ON. OFF is displayed when the TBC is not commanding the Head Lamp Power Relay Coil ON. This will not allow current to the Head Lamp Power Relay Coil and the Head Lamps will be OFF.

DRL Relay - Range: ON / OFF

This output refers to the commanded state of the Daytime Running Lamps (DRL) Relay Coil. ON is displayed when the TBC is commanded the Daytime Running Lamp Relay Coil ON. This allows the relay to power up the Daytime Running Lamps. OFF is displayed when the TBC is not commanding the Daytime Running Lamp Relay Coil ON. This will not allow current to the Daytime Running Lamps Relay Coil and the Daytime Running Lamps will be OFF.

Park Lamp Relay - Range: ON / OFF

This output refers to the commanded state of the Park Lamp Relay Coil. ON is displayed when the TBC is commanding Park Lamp Relay Coil ON. This allows the relay to power up the Park Lamps. OFF is displayed when the TBC is not commanding the Park Lamp Relay Coil ON. This will not allow current to the Park Lamps and the Park Lamps will be OFF.

Courtesy Lamp Relay - Range: ON / OFF

This output refers to the commanded state of the Courtesy Lamp Relay Coil. ON is displayed when the TBC is commanding the Courtesy Lamp Relay Coil ON. This allows the relay to power up the Courtesy Lamps and the Courtesy Lamps will be ON. OFF is displayed when the TBC is not commanding the Courtesy Lamp Relay Coil ON and the Courtesy Lamps to be OFF.

Dimming - Range: ACTIVE / INACTIVE

This output refers to the state of the Head Lamp switch Dimming feature. The Head Lamp switch Dimming feature is a term used to describe the customers ability to control the illumination of the Instrument Panel Cluster, PRND, and PSIR switch with the use of the Dome Lamp Switch (thumbwheel) near the Head Lamp switch. The up and down movement of the Dome Lamp Switch allows the customer the ability to control the brightness of these components. INACTIVE is displayed when the Park Lamps are OFF. ACTIVE is displayed when the Park Lamps are ON and then the up and down movement of the Dome Lamp Switch allows the customer the ability to control the brightness of these components.

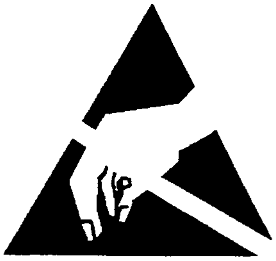
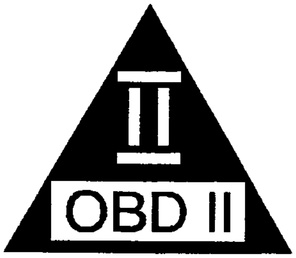
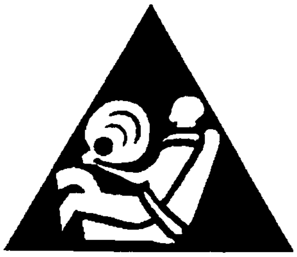
Horn Relay - Range: ON / OFF

This output refers to the commanded state of the Horn Relay Coil. The Horn Button is an input to the TBC. The TBC can supply a ground to the Horn Relay Coil and sound the Horns. ON is displayed when the TBC is commanding the Horn Relay Coil ON by the Horn button being pressed. OFF is displayed when the TBC is not commanding the Horn Relay Coil ON and the Horn Button is not pressed.

Truck Body Control Module Schematic References

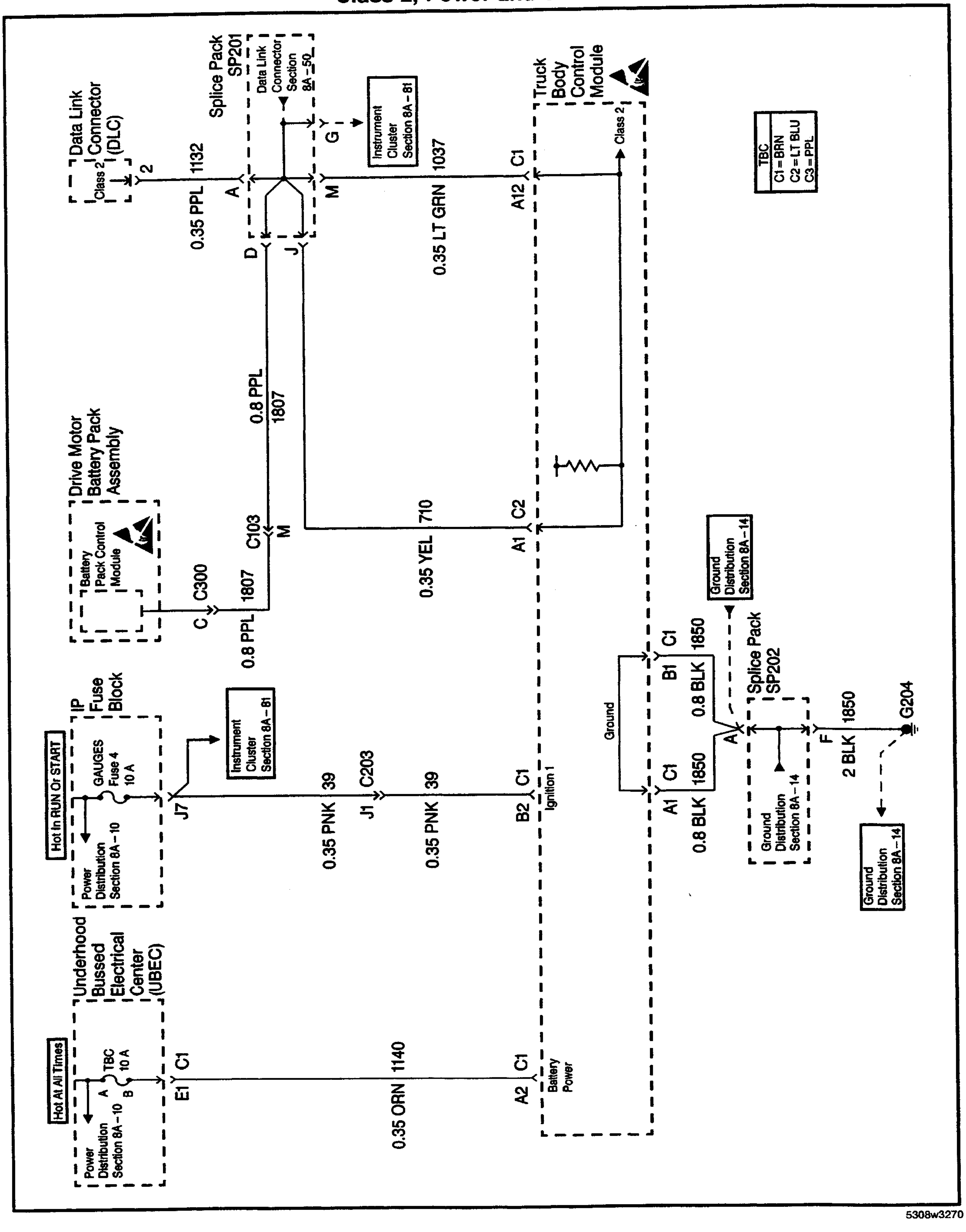
Reference on Schematic	Section Number Subsection Name
Symbols	8A-3 Symbols
Troubleshooting Procedures	8A-4 Troubleshooting Procedures
Repair Procedures	8A-5 Repair Procedures
Power Distribution	8A-10 Power Distribution
Ground Distribution	8A-14 Ground Distribution
Retained Accessory Power	8A-15 Retained Accessory Power
Horns	8A-40 - Horns
Brake Warning System	8A-41 - Brake Warning System
Data Link Connector (DLC)	8A-50 - Data Link Connector (DLC)
Truck Body Control Module (TBC)	8A-51 - Truck Body Control Module
Vehicle Speed	8A-76 - Audible Warnings
Head Lamp Reminder	8A-76 - Audible Warnings
Key In Reminder	8A-76 - Audible Warnings
Seat Belt Reminder	8A-76 - Audible Warnings
Turn Signal Reminder	8A-76 - Audible Warnings
Instrument Panel Cluster (IPC)	8A-81 – Instrument Panel Cluster (IPC)
Head Lamps	8A-100 Head Lamps
Daytime Running Lamps	8A-102 Daytime Running Lamps
Exterior Lights	8A-110 Exterior Lights
Backup Lights	8A-112 Backup Lights
Interior Lights	8A-114 Interior Lights
Interior Lights Dimming	8A-117 Interior Lights Dimming
Column/Ignition Lock	8A-139 Column/Ignition Lock
Radio/Audio Systems	8A-150 Radio/Audio Systems

Truck Body Control Module Schematic Icons

Icon	Icon Definition
19384 	Refer to *Electrostatic Discharge (ESD) Sensitive Devices in 8A-3 Symbols.*
19385  	Refer to *ON Board Diagnostic II (OBD II) Symbols in 8A-3 Symbols.*
19386 	Refer to *Supplemental Inflatable Restraints (SIR) Systems in 8A-3 Symbols.*

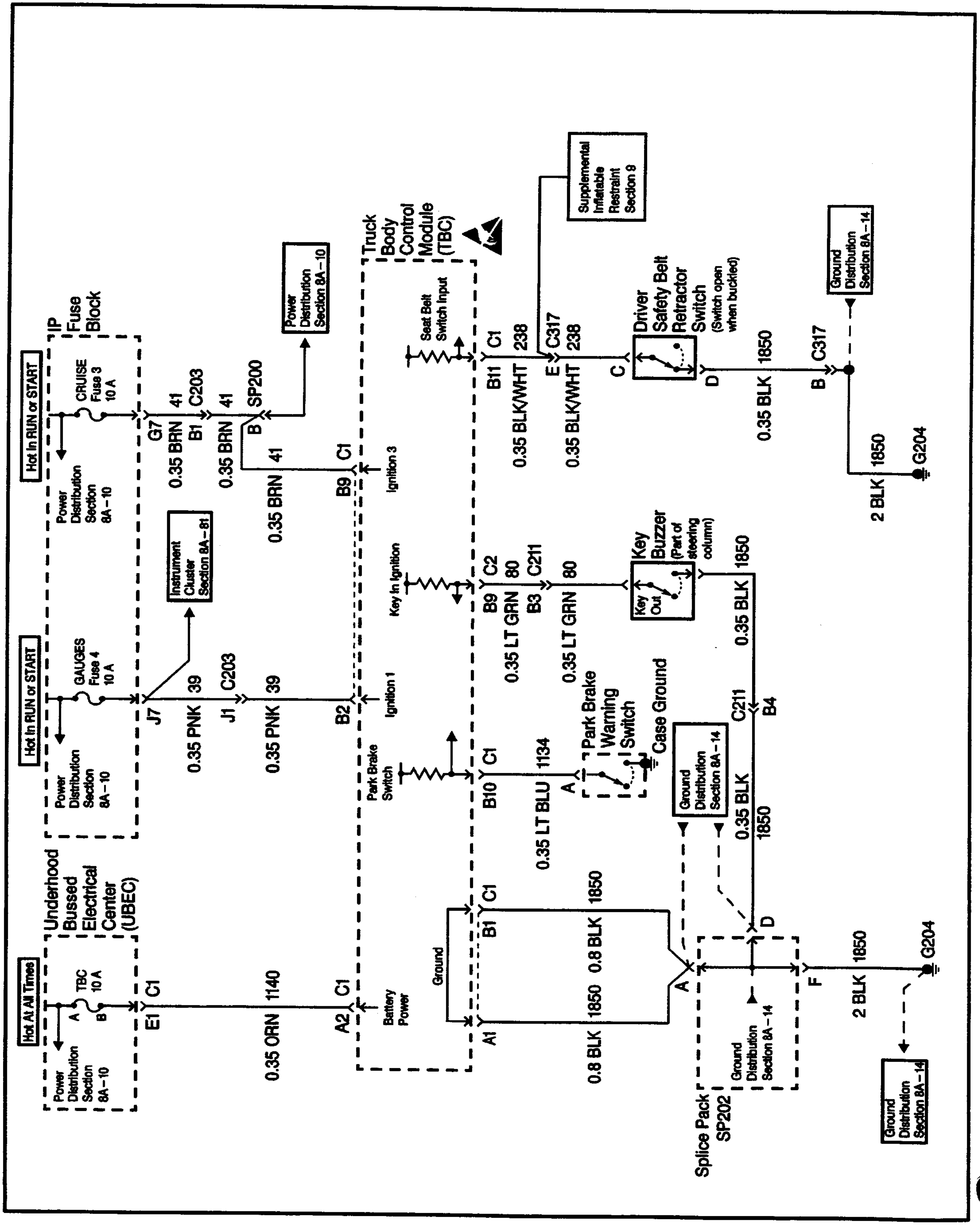
Truck Body Control Module Schematics

Class 2, Power and Ground


Hot At All Times
Power Distribution Section 8A-10
A
B
TBC 10 A
Underhood Bussed Electrical Center (UBEC)
E1
C1
0.35 ORN
1140
A2
C1
Battery Power
Hot In RUN Or START
Power Distribution Section 8A-10
GAUGES Fuse 4 10 A
IP Fuse Block
J7
Instrument Cluster Section 8A-81
0.35 PNK
39
J1
C203
0.35 PNK
39
B2
C1
Ignition 1
Drive Motor Battery Pack Assembly
Battery Pack Control Module
C
C300
0.8 PPL
1807
C103
M
0.8 PPL
1807
Data Link Connector (DLC)
Class 2
2
0.35 PPL
1132
A
Splice Pack SP201
Data Link Connector Section 8A-50
G
Instrument Cluster Section 8A-81
M
D
J
0.35 LT GRN
1037
A12
C1
0.35 YEL
710
A1
C2
Truck Body Control Module
Class 2
Ground
A1
C1
0.8 BLK
1850
B1
C1
0.8 BLK
1850
Ground Distribution Section 8A-14
Splice Pack SP202
A
F
Ground Distribution Section 8A-14
2 BLK
1850
G204
Ground Distribution Section 8A-14
TBC
C1=BRN
C2=LT BLU
C3=PPL

5308w3270

Inputs


Hot At All Times
Power Distribution Section 8A-10
TBC 10 A
A
B
Underhood Bussed Electrical Center (UBEC)
E1
C1
0.35 ORN
1140
A2
C1
Battery Power
Hot In RUN or START
Power Distribution Section 8A-10
GAUGES Fuse 4 10 A
J7
0.35 PNK
39
J1
C203
0.35 PNK
39
B2
Ignition 1
Instrument Cluster Section 8A-81
Hot In RUN or START
Power Distribution Section 8A-10
CRUISE Fuse 3 10 A
IP Fuse Block
G7
0.35 BRN
41
B1
C203
0.35 BRN
41
B
SP200
0.35 BRN
41
B9
C1
Ignition 3
Power Distribution Section 8A-10
Truck Body Control Module (TBC)
Ground
Park Brake Switch
Key In Ignition
Seat Belt Switch Input
A1
0.8 BLK
1850
B1
C1
0.8 BLK
1850
B10
C1
0.35 LT BLU
1134
A
Park Brake Warning Switch
Case Ground
B9
C2
0.35 LT GRN
80
B3
C211
0.35 LT GRN
80
Key Buzzer (Part of steering column)
Key Out
0.35 BLK
1850
B11
C1
0.35 BLK/WHT
238
E
C317
0.35 BLK/WHT
238
C
Driver Safety Belt Retractor Switch (Switch open when buckled)
D
0.35 BLK
1850
B
C317
Supplemental Inflatable Restraint Section 9
Ground Distribution Section 8A-14
2 BLK
1850
G204
C211
B4
0.35 BLK
1850
Ground Distribution Section 8A-14
D
A
Splice Pack SP202
Ground Distribution Section 8A-14
F
2 BLK
1850
G204
Ground Distribution Section 8A-14

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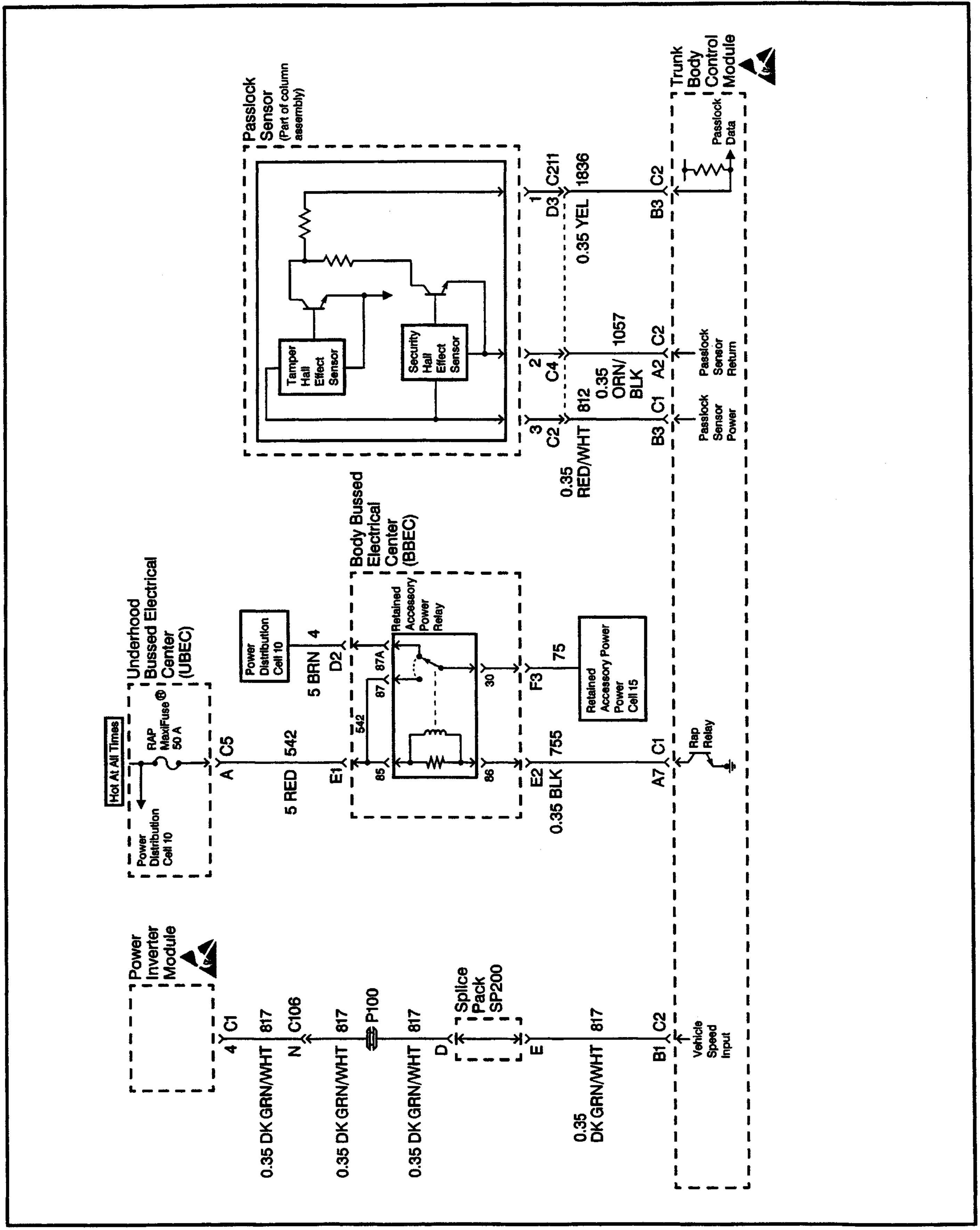
Inputs


Power Inverter Module
4
C1
817
0.35 DK GRN/WHT
N
C106
817
0.35 DK GRN/WHT
P100
817
0.35 DK GRN/WHT
D
Splice Pack SP200
E
817
0.35 DK GRN/WHT
B1
C2
Vehicle Speed Input
Underhood Bussed Electrical Center (UBEC)
Hot At All Times
Power Distribution Cell 10
RAP MaxiFuse® 50 A
A
C5
542
5 RED
E1
Power Distribution Cell 10
4
5 BRN
D2
Body Bussed Electrical Center (BBEC)
Retained Accessory Power Relay
87A
87
542
85
30
86
F3
75
Retained Accessory Power Cell 15
E2
755
0.35 BLK
A7
C1
Rap Relay
Passlock Sensor (Part of column assembly)
Tamper Hall Effect Sensor
Security Hall Effect Sensor
3
C2
812
0.35 RED/WHT
B3
C1
Passlock Sensor Power
2
C4
1057
0.35 ORN/BLK
A2
C2
Passlock Sensor Return
1
D3
C211
1836
0.35 YEL
B3
C2
Passlock Data
Truck Body Control Module

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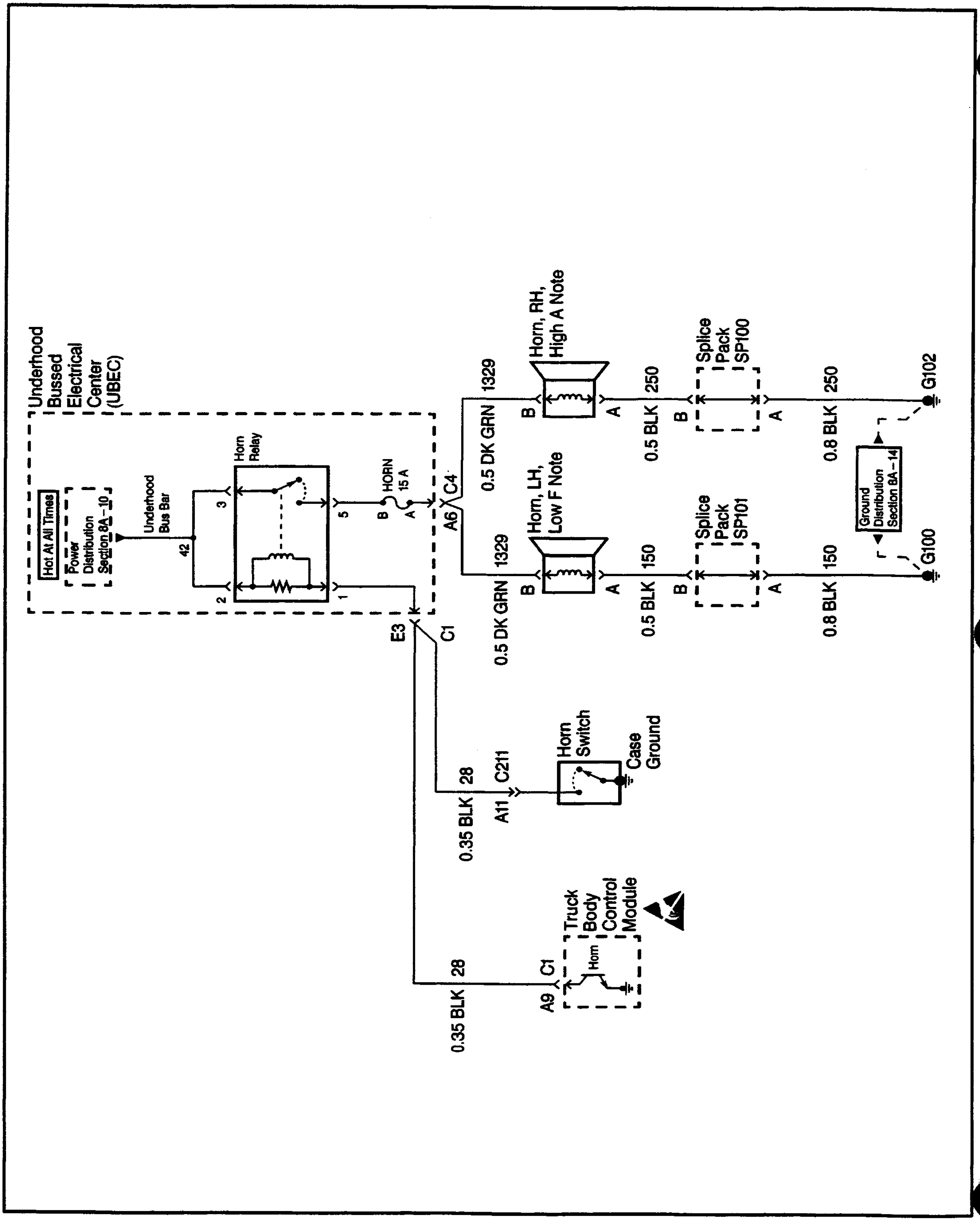
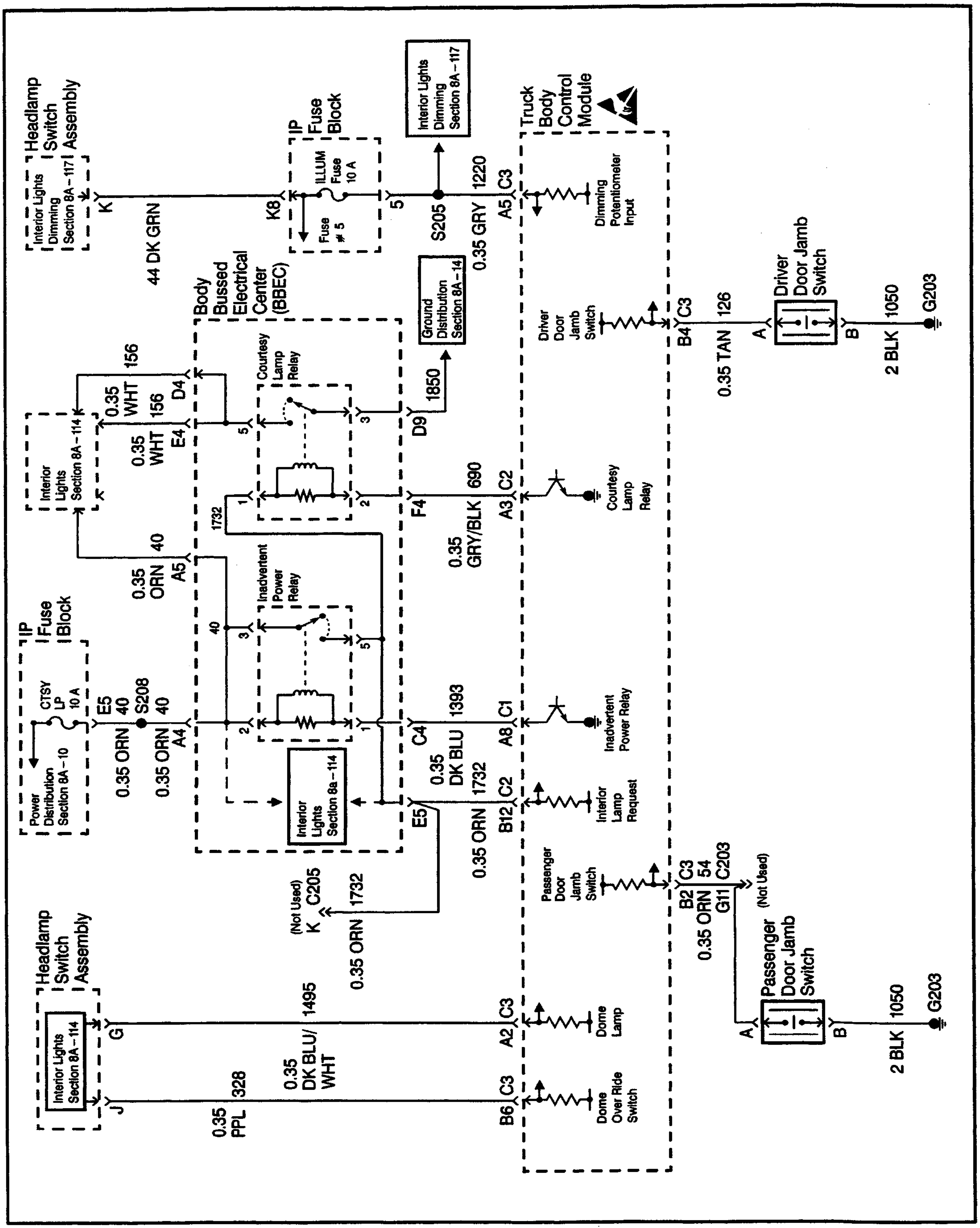
Horns


Underhood Bussed Electrical Center (UBEC)
Hot At All Times
Power Distribution Section 8A-10
Underhood Bus Bar
42
Horn Relay
3
2
5
1
HORN 15 A
B
A
C4
A6
E3
C1
0.5 DK GRN
1329
Horn, RH, High A Note
Horn, LH, Low F Note
0.5 BLK
250
150
Splice Pack SP100
Splice Pack SP101
0.8 BLK
G102
G100
Ground Distribution Section 8A-14
0.35 BLK
28
C211
A11
Horn Switch
Case Ground
Truck Body Control Module
Horn
A9

5308w3272

Interior Lights


Headlamp Switch Assembly
Interior Lights Dimming Section 8A-117
K
44 DK GRN
K8
IP Fuse Block
Fuse # 5
ILLUM Fuse 10 A
5
S205
1220
0.35 GRY
A5
C3
Interior Lights Dimming Section 8A-117
Truck Body Control Module
Dimming Potentiometer Input
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
1850
D9
Courtesy Lamp Relay
Interior Lights Section 8A-114
156
0.35 WHT
D4
E4
3
5
1
2
1732
F4
690
0.35 GRY/BLK
A3
C2
Driver Door Jamb Switch
B4
C3
126
0.35 TAN
A
B
1050
2 BLK
G203
Driver Door Jamb Switch
40
0.35 ORN
A5
Inadvertent Power Relay
IP Fuse Block
Power Distribution Section 8A-10
CTSY LP 10 A
E5
S208
0.35 ORN
A4
C4
1393
0.35 DK BLU
A8
C1
Inadvertent Power Relay
Interior Lights Section 8a-114
E5
0.35 ORN
1732
B12
C2
Interior Lamp Request
(Not Used)
K
C205
1732
0.35 ORN
Passenger Door Jamb Switch
B2
C3
54
0.35 ORN
G11
C203
(Not Used)
Passenger Door Jamb Switch
A
B
1050
2 BLK
G203
Headlamp Switch Assembly
Interior Lights Section 8A-114
G
1495
0.35 DK BLU/WHT
A2
C3
Dome Lamp
J
328
0.35 PPL
B6
C3
Dome Over Ride Switch

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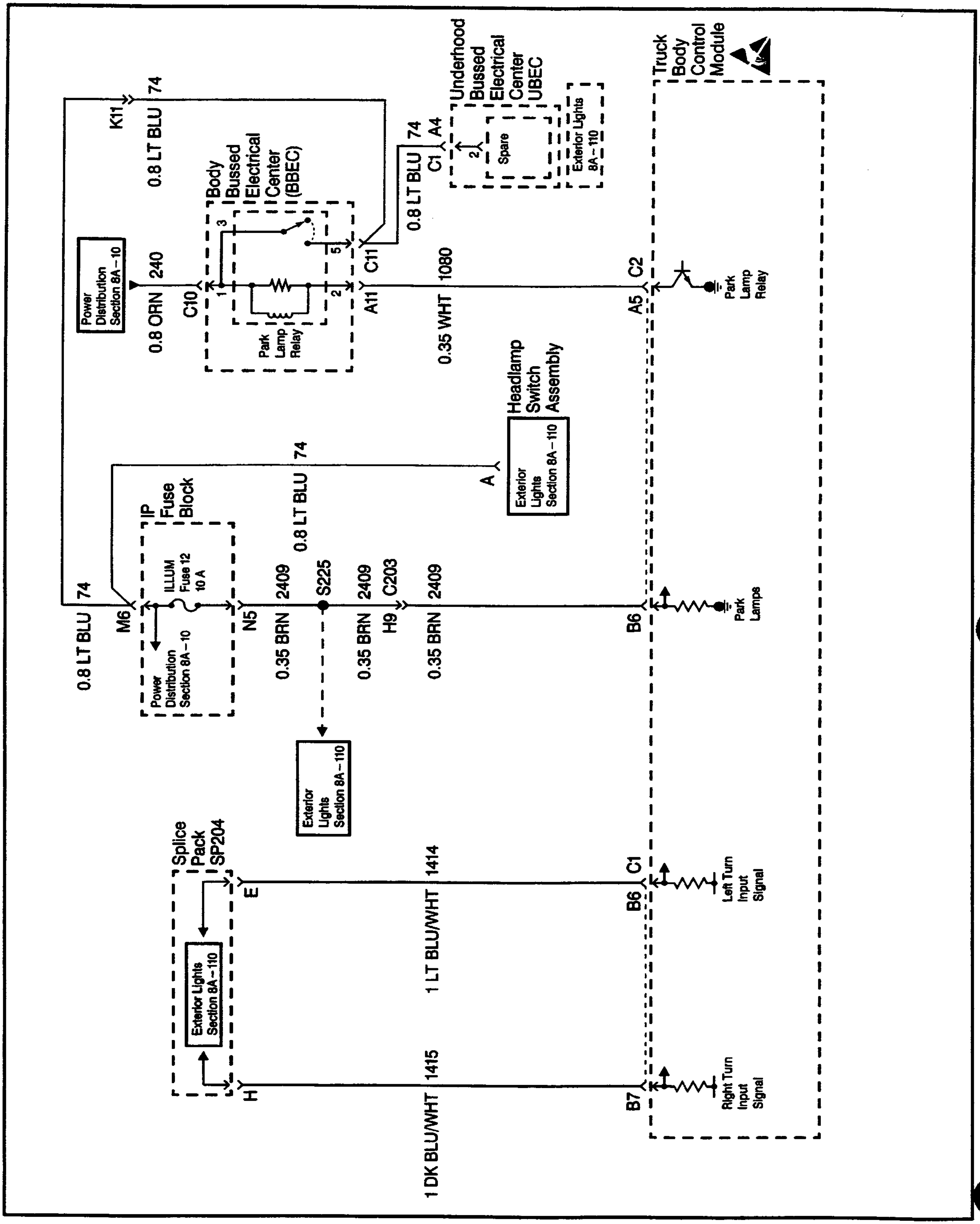
Exterior Lights


Truck Body Control Module
Underhood Bussed Electrical Center UBEC
Spare
2
C1
A4
74
Exterior Lights 8A-110
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
3
5
1
2
C10
C11
A11
Power Distribution Section 8A-10
240
0.8 ORN
0.8 LT BLU
74
K11
1080
0.35 WHT
C2
A5
Park Lamp Relay
Headlamp Switch Assembly
Exterior Lights Section 8A-110
A
IP Fuse Block
ILLUM Fuse 12 10 A
Power Distribution Section 8A-10
M6
N5
2409
0.35 BRN
S225
C203
H9
B6
Park Lamps
Exterior Lights Section 8A-110
Splice Pack SP204
Exterior Lights Section 8A-110
E
H
1414
1 LT BLU/WHT
1415
1 DK BLU/WHT
C1
B6
B7
Left Turn Input Signal
Right Turn Input Signal

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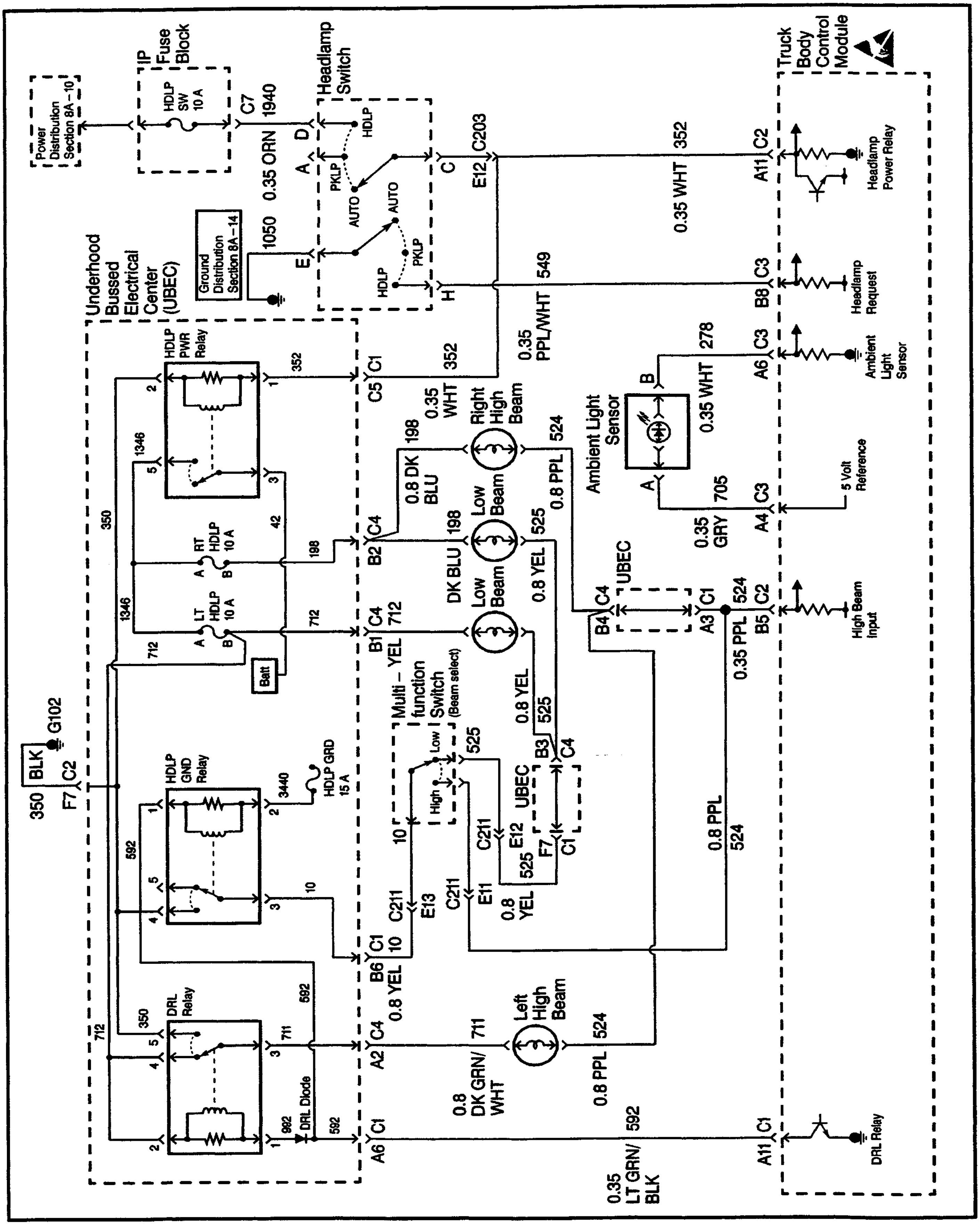
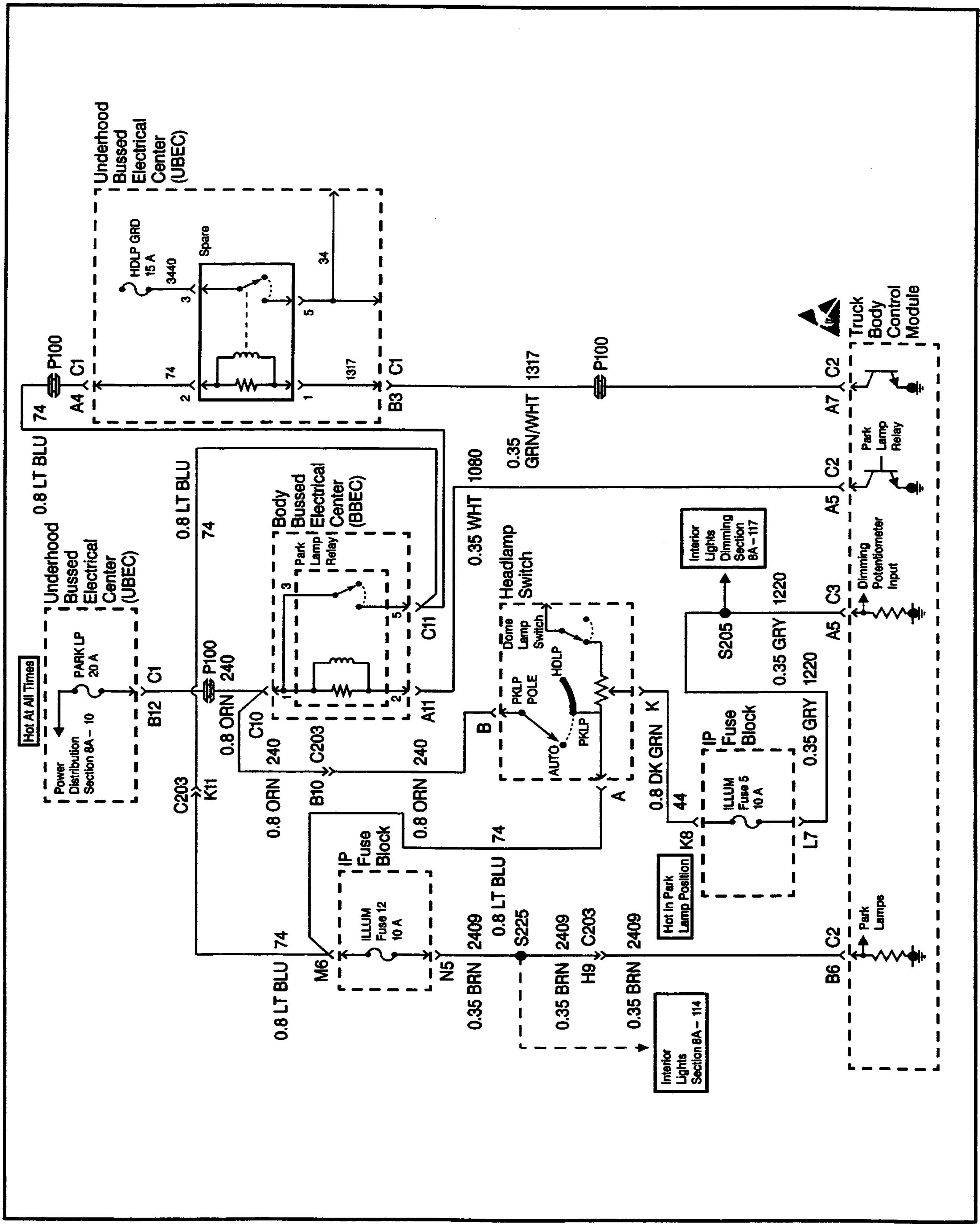
Head Lamps


Power Distribution Section 8A-10
IP Fuse Block
HDLP SW 10 A
C7
1940
0.35 ORN
Headlamp Switch
D
A
HDLP
PKLP
AUTO
AUTO
PKLP
HDLP
C
E
H
1050
Ground Distribution Section 8A-14
C203
E12
352
0.35 WHT
Truck Body Control Module
C2
A11
Headlamp Power Relay
549
0.35 PPL/WHT
C3
B8
Headlamp Request
278
0.35 WHT
C3
A6
Ambient Light Sensor
Ambient Light Sensor
B
A
705
0.35 GRY
C3
A4
5 Volt Reference
524
C2
B5
High Beam Input
0.35 PPL
C1
A3
UBEC
C4
B4
Underhood Bussed Electrical Center (UBEC)
HDLP PWR Relay
352
C1
C5
1346
42
RT HDLP 10 A
198
C4
B2
LT HDLP 10 A
712
C4
B1
Batt
350
1346
712
Right High Beam
198
0.8 DK BLU
0.35 WHT
524
0.8 PPL
Low Beam
198
DK BLU
525
0.8 YEL
Low Beam
712
YEL
0.8 YEL
525
Multi-function Switch (Beam select)
Low
High
525
10
C4
B3
UBEC
C1
F7
C211
E12
525
C211
E13
C211
E11
0.8 YEL
350
BLK
C2
F7
G102
HDLP GND Relay
3440
HDLP GRD 15 A
592
10
C1
B6
0.8 YEL
DRL Relay
350
711
592
DRL Diode
592
C4
A2
C1
A6
Left High Beam
711
0.8 DK GRN/WHT
524
0.8 PPL
0.8 PPL
524
592
0.35 LT GRN/BLK
C1
A11
DRL Relay

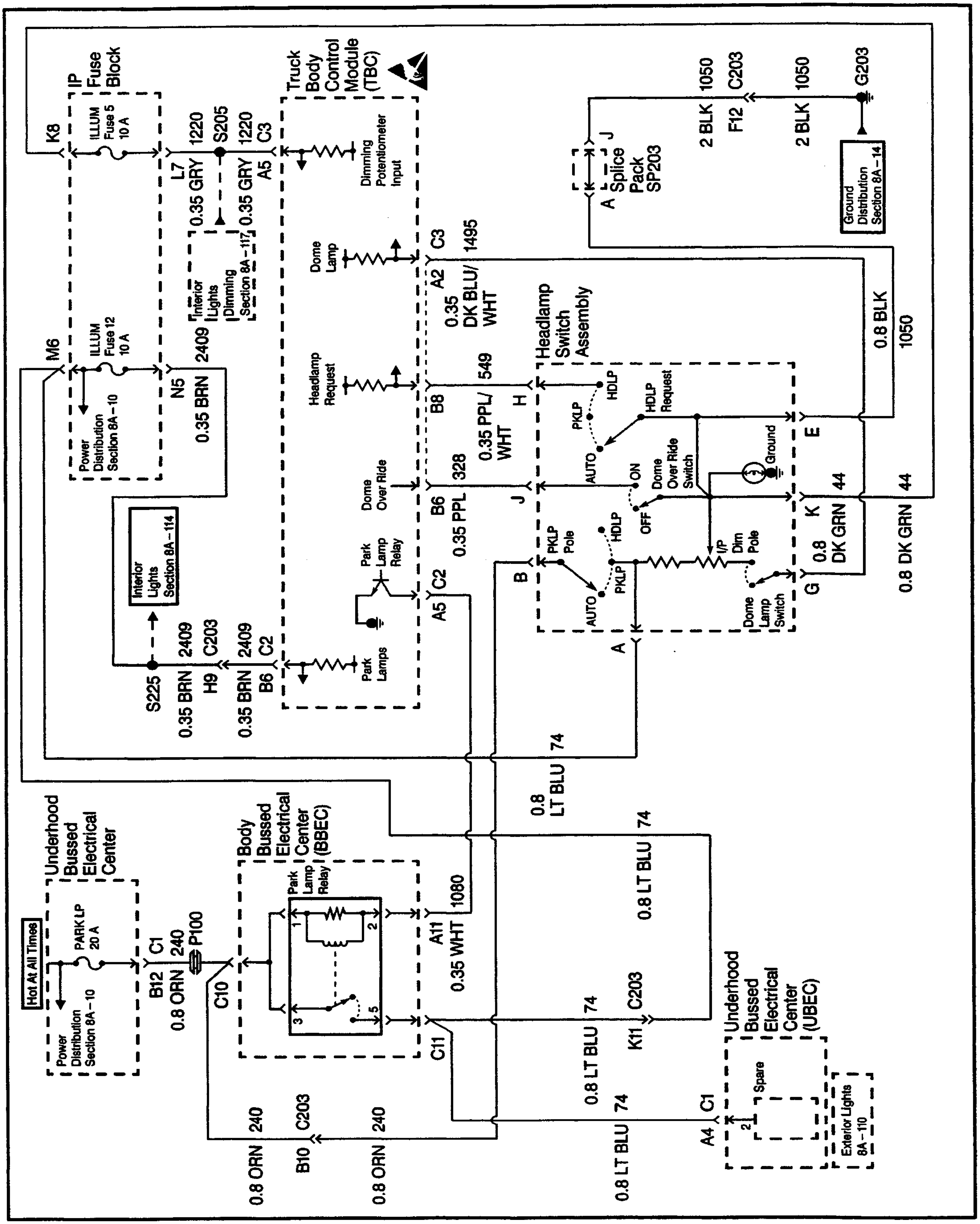
5308w3274

Dimming Control

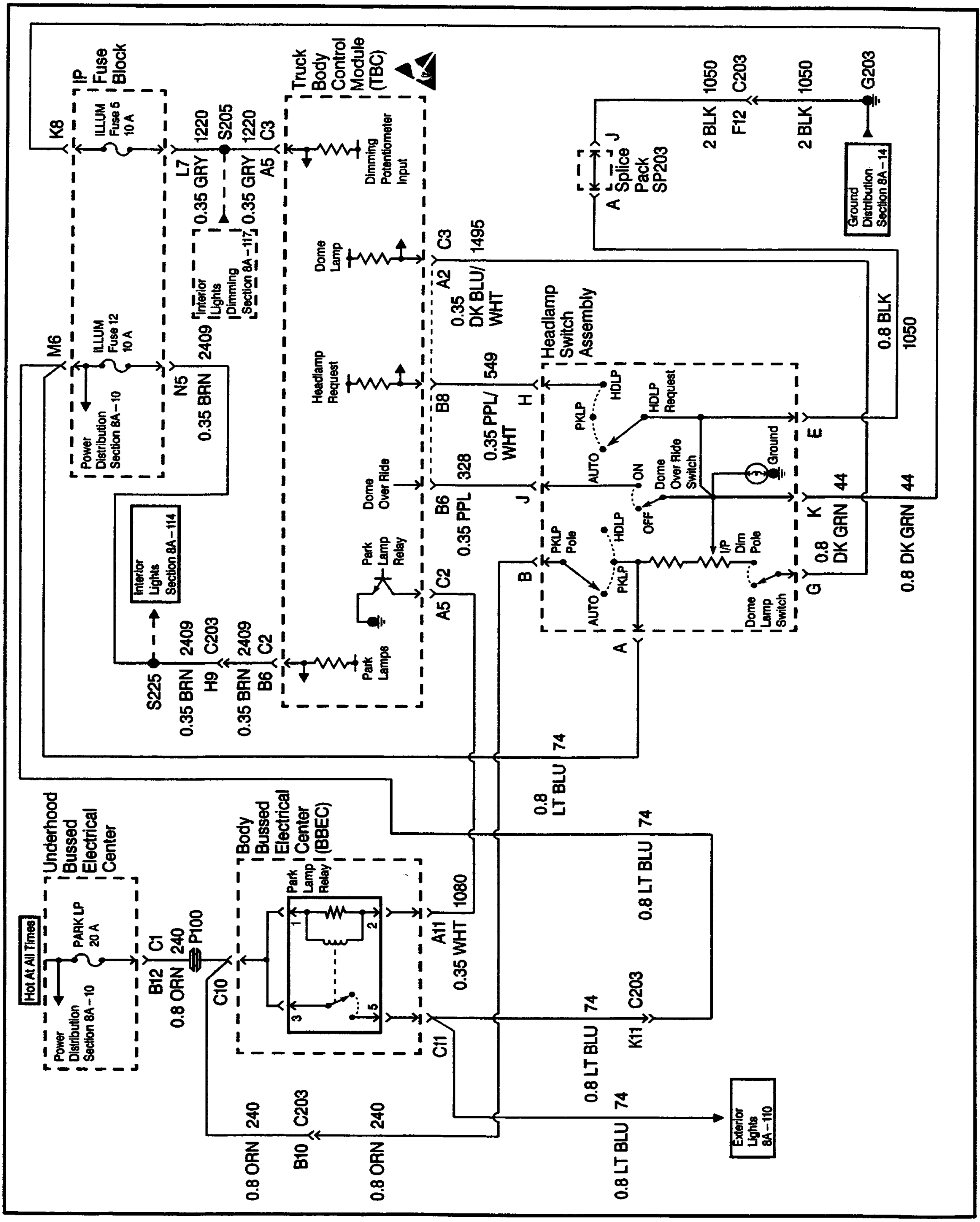

Underhood Bussed Electrical Center (UBEC)
HDLP GRD 15 A
3440
Spare
3
34
5
74
2
1
1317
C1
B3
A4
P100
0.8 LT BLU
74
0.35 GRN/WHT
1317
Truck Body Control Module
C2
A7
Park Lamp Relay
C2
A5
1080
0.35 WHT
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
C11
A11
C10
240
0.8 ORN
Hot At All Times
Power Distribution Section 8A-10
PARK LP 20 A
B12
C203
K11
B10
Headlamp Switch
Dome Lamp Switch
HDLP
PKLP POLE
PKLP
AUTO
B
A
K
0.8 DK GRN
44
Interior Lights Dimming Section 8A-117
S205
0.35 GRY
1220
C3
A5
Dimming Potentiometer Input
IP Fuse Block
ILLUM Fuse 5 10 A
K8
L7
Hot in Park Lamp Position
IP Fuse Block
ILLUM Fuse 12 10 A
M6
N5
0.35 BRN
2409
S225
H9
C2
B6
Park Lamps
Interior Lights Section 8A-114

5308w3278

Park Lamps

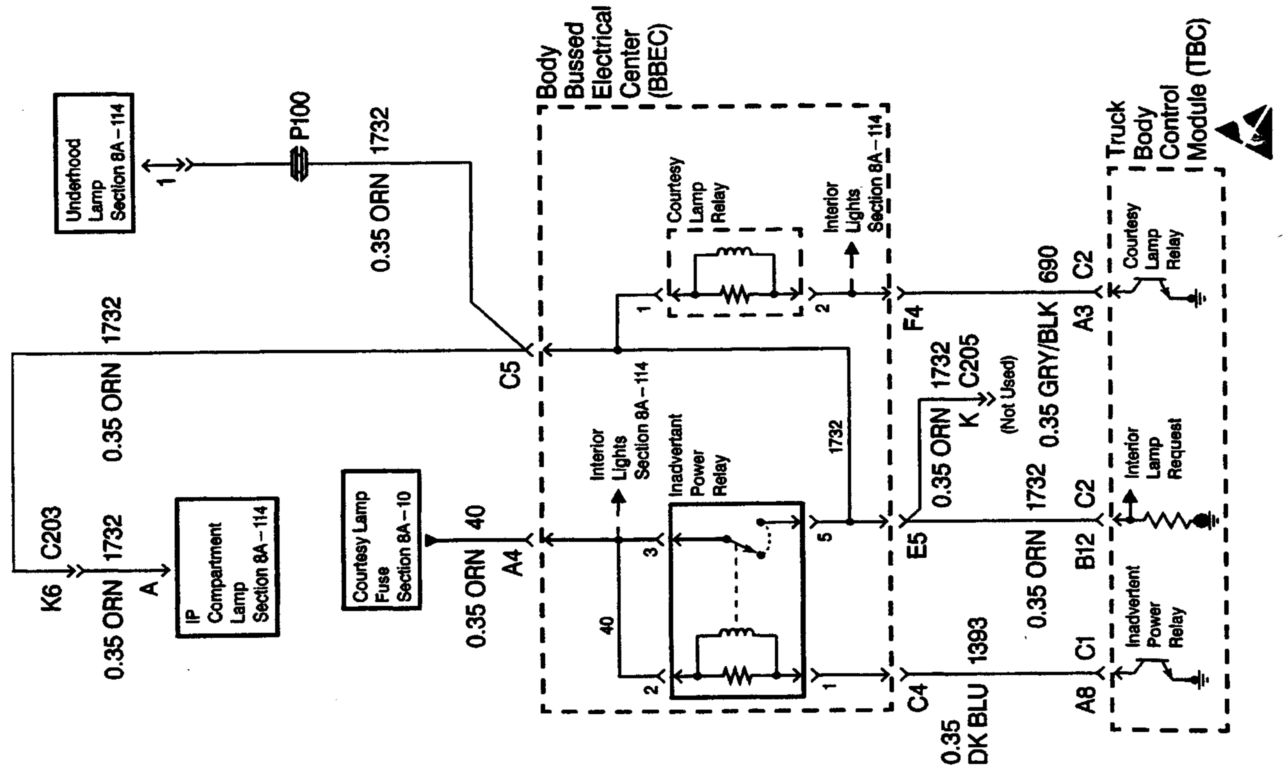

IP Fuse Block
ILLUM Fuse 5 10 A
ILLUM Fuse 12 10 A
Power Distribution Section 8A-10
K8
L7
M6
N5
1220
S205
C3
A5
0.35 GRY
Interior Lights Dimming Section 8A-117
2409
0.35 BRN
Interior Lights Section 8A-114
S225
H9
C203
C2
B6
Truck Body Control Module (TBC)
Dimming Potentiometer Input
Dome Lamp
Headlamp Request
Dome Over Ride
Park Lamp Relay
Park Lamps
A2
1495
0.35 DK BLU/ WHT
B8
549
0.35 PPL/ WHT
328
0.35 PPL
Headlamp Switch Assembly
HDLP
PKLP
AUTO
HDLP Request
ON
OFF
Dome Over Ride Switch
Ground
PKLP Pole
I/P Dim Pole
Dome Lamp Switch
H
J
B
A
E
K
G
44
0.8 DK GRN
0.8 BLK
1050
J
K
A
Splice Pack SP203
2 BLK
F12
G203
Ground Distribution Section 8A-14
74
0.8 LT BLU
Underhood Bussed Electrical Center
Hot At All Times
PARK LP 20 A
B12
C1
0.8 ORN
240
P100
C10
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
1
2
3
5
A11
1080
0.35 WHT
C11
K11
B10
A4
Underhood Bussed Electrical Center (UBEC)
Spare
Exterior Lights 8A-110
5308w3279

Interior Lights Dimming Control


IP Fuse Block
ILLUM Fuse 5 10 A
ILLUM Fuse 12 10 A
K8
M6
L7
N5
Power Distribution Section 8A-10
0.35 GRY 1220
S205
0.35 GRY 1220
A5 C3
Interior Lights Dimming Section 8A-117
0.35 BRN 2409
Interior Lights Section 8A-114
S225
0.35 BRN 2409
H9 C203
0.35 BRN 2409
B6 C2
Truck Body Control Module (TBC)
Dimming Potentiometer Input
Dome Lamp
Headlamp Request
Dome Over Ride
Park Lamp Relay
Park Lamps
C3 A2
0.35 DK BLU/WHT 1495
B8
0.35 PPL/WHT 549
B6
0.35 PPL 328
C2 A5
Headlamp Switch Assembly
H
J
B
A
E
K
G
HDLP
PKLP
AUTO
HDLP Request
ON
OFF
Dome Over Ride Switch
Ground
PKLP Pole
I/P Dim Pole
Dome Lamp Switch
0.8 DK GRN 44
0.8 DK GRN 44
0.8 BLK 1050
Splice Pack SP203
A
J
2 BLK 1050
F12 C203
2 BLK 1050
G203
Ground Distribution Section 8A-14
0.8 LT BLU 74
0.8 LT BLU 74
Underhood Bussed Electrical Center
Hot At All Times
PARK LP 20 A
Power Distribution Section 8A-10
B12 C1
0.8 ORN 240
P100
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
1
2
3
5
C10
A11
0.35 WHT 1080
C11
0.8 LT BLU 74
K11 C203
0.8 LT BLU 74
0.8 LT BLU 74
Exterior Lights 8A-110
0.8 ORN 240
B10 C203
0.8 ORN 240

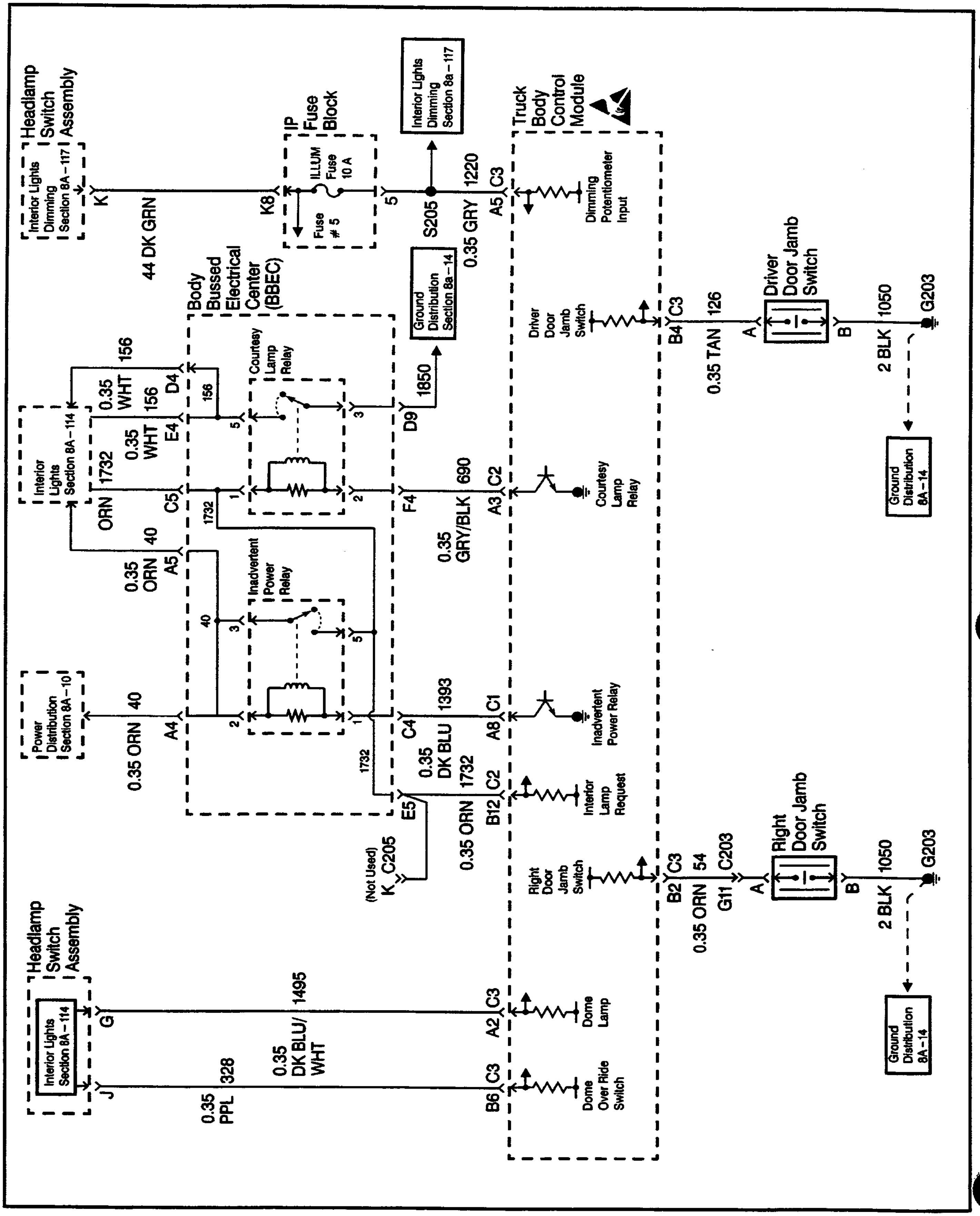
5308w3280

Interior Lamps Request


Body Bussed Electrical Center (BBEC)
Underhood Lamp Section 8A-114
1
P100
0.35 ORN 1732
C5
0.35 ORN 1732
K6 C203
0.35 ORN 1732
A
IP Compartment Lamp Section 8A-114
Courtesy Lamp Fuse Section 8A-10
0.35 ORN 40
A4
Interior Lights Section 8A-114
Inadvertant Power Relay
40
3
2
5
1
1732
Courtesy Lamp Relay
1
2
Interior Lights Section 8A-114
F4
E5
C4
0.35 ORN 1732
C205 K
(Not Used)
690
0.35 GRY/BLK
A3 C2
0.35 ORN 1732
B12 C2
0.35 DK BLU 1393
A8 C1
Truck Body Control Module (TBC)
Courtesy Lamp Relay
Interior Lamp Request
Inadvertent Power Relay

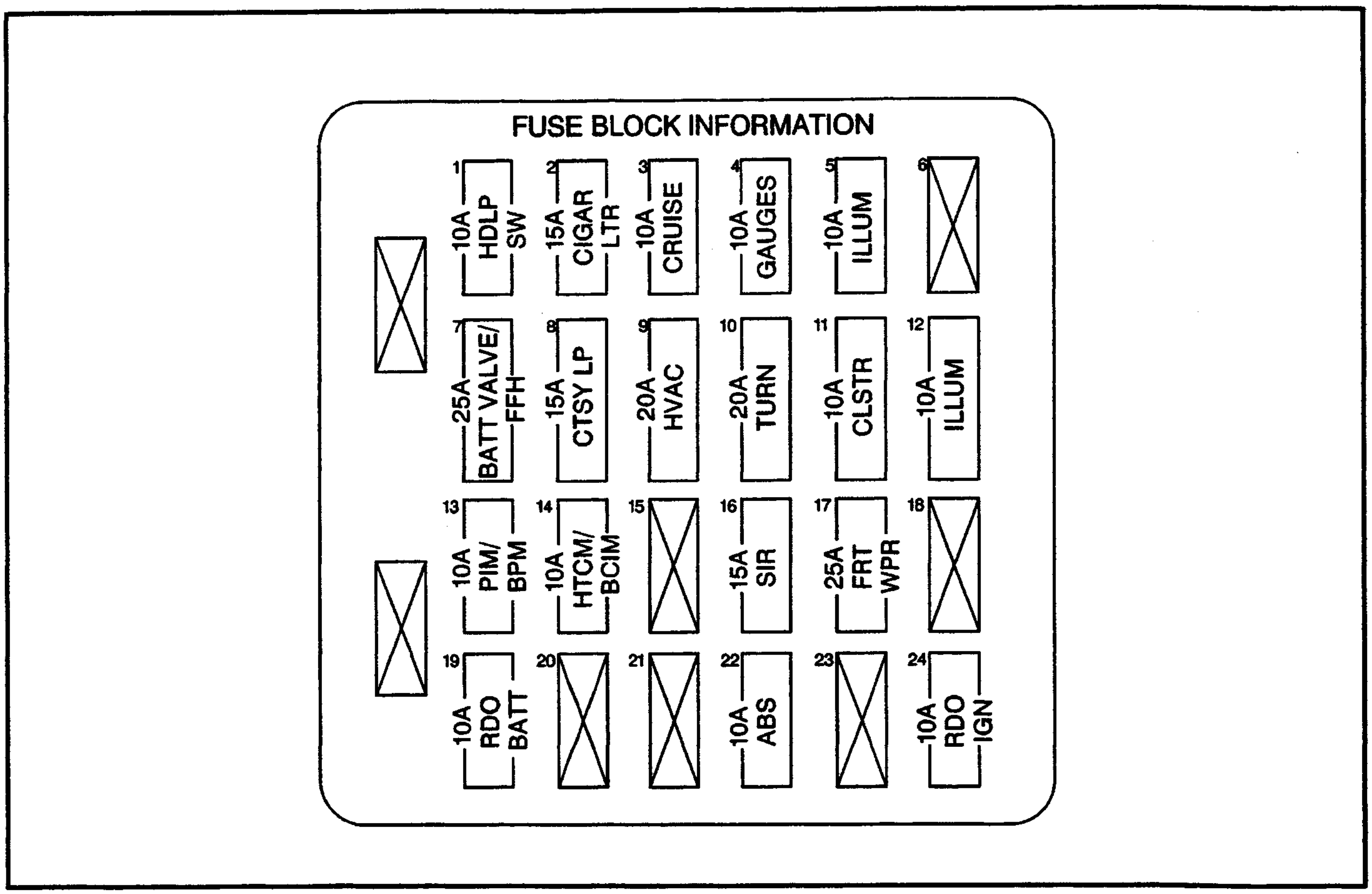
5308w3281

Inadvertent Power Circuit


Headlamp Switch Assembly
Interior Lights Dimming Section 8A-117
K
44 DK GRN
IP Fuse Block
ILLUM Fuse 10 A
Fuse # 5
K8
5
S205
Interior Lights Dimming Section 8a-117
1220
C3
A5
0.35 GRY
Ground Distribution Section 8a-14
Truck Body Control Module
Dimming Potentiometer Input
Body Bussed Electrical Center (BBEC)
Courtesy Lamp Relay
156
0.35 WHT
D4
E4
1850
D9
3
Interior Lights Section 8A-114
1732
ORN
C5
40
0.35 ORN
A5
690
F4
C2
A3
0.35 GRY/BLK
2
1
Inadvertent Power Relay
Power Distribution Section 8A-10
0.35 ORN
A4
1393
C4
C1
A8
0.35 DK BLU
E5
B12
0.35 ORN
Interior Lamp Request
(Not Used) K C205
Driver Door Jamb Switch
B4
126
0.35 TAN
A
B
1050
2 BLK
G203
Ground Distribution 8A-14
Right Door Jamb Switch
B2
54
C203
G11
Headlamp Switch Assembly
Interior Lights Section 8A-114
G
J
1495
0.35 DK BLU/WHT
A2
Dome Lamp
328
0.35 PPL
B6
Dome Over Ride Switch

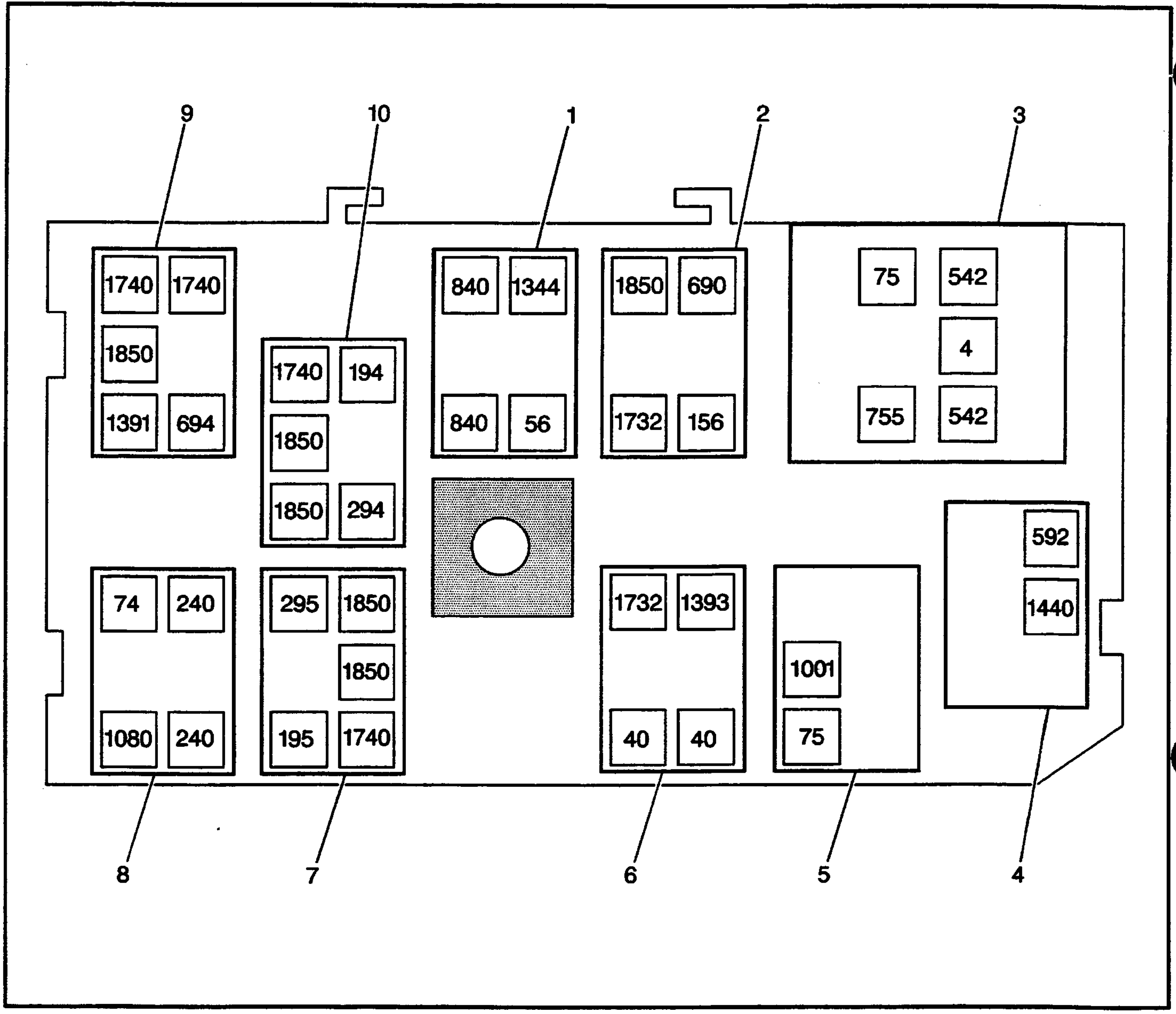
5308w3277

Instrument Panel Fuse Block


FUSE BLOCK INFORMATION
1 10A HDLP SW
2 15A CIGAR LTR
3 10A CRUISE
4 10A GAUGES
5 10A ILLUM
6
7 25A BATT VALVE/ FFH
8 15A CTSY LP
9 20A HVAC
10 20A TURN
11 10A CLSTR
12 10A ILLUM
13 10A PIM/ BPM
14 10A HTCM/ BCIM
15
16 15A SIR
17 25A FRT WPR
18
19 10A RDO BATT
20
21
22 10A ABS
23
24 10A RDO IGN

5308w3254

Body Bussed Electrical Center (BBEC)

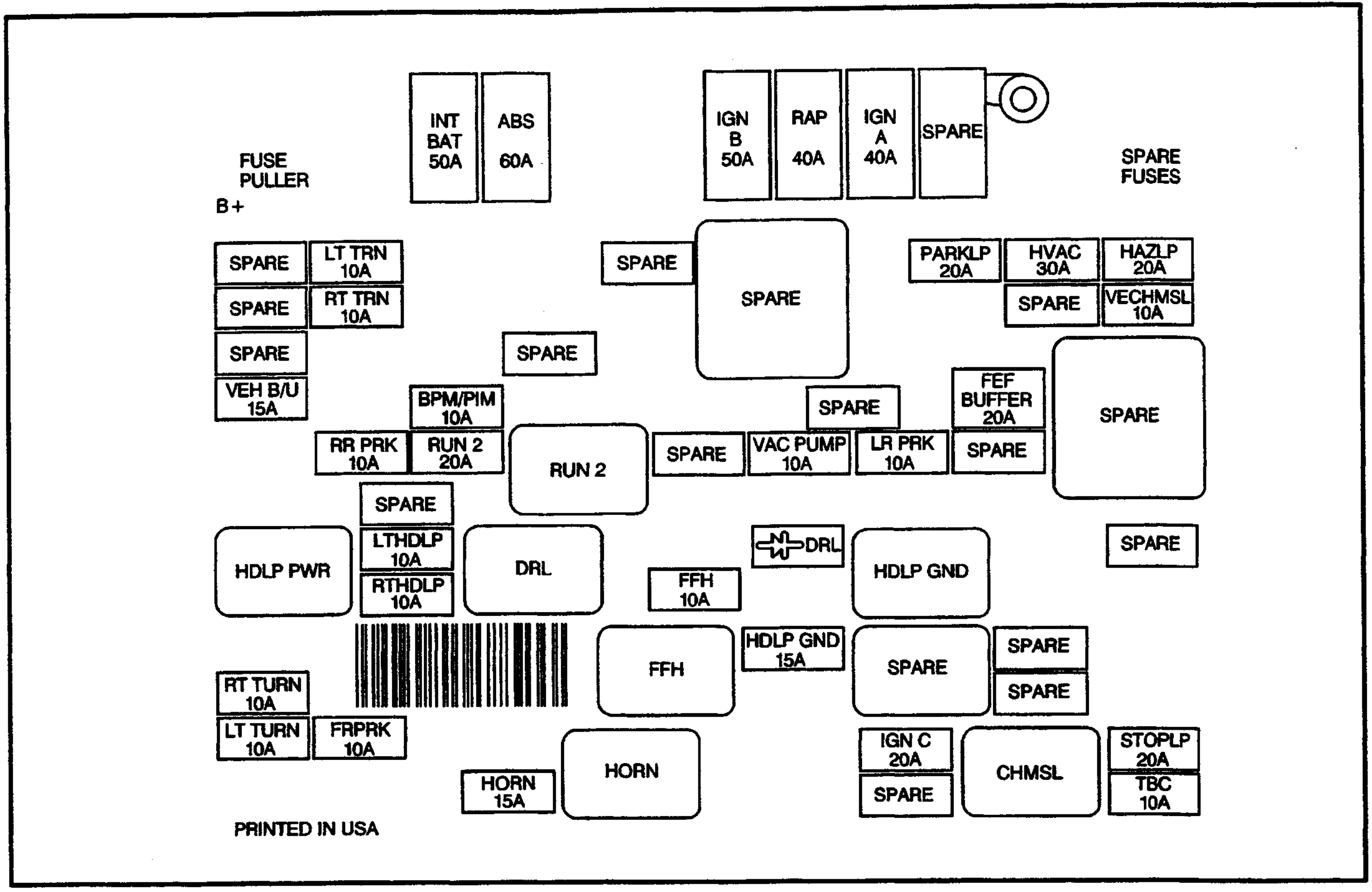

9
10
1
2
3
1740
1740
1850
1391
694
1740
194
1850
1850
294
840
1344
840
56
1850
690
1732
156
75
542
4
755
542
592
1440
74
240
1080
240
295
1850
1850
195
1740
1732
1393
40
40
1001
75
8
7
6
5
4

5308w3255

Legend

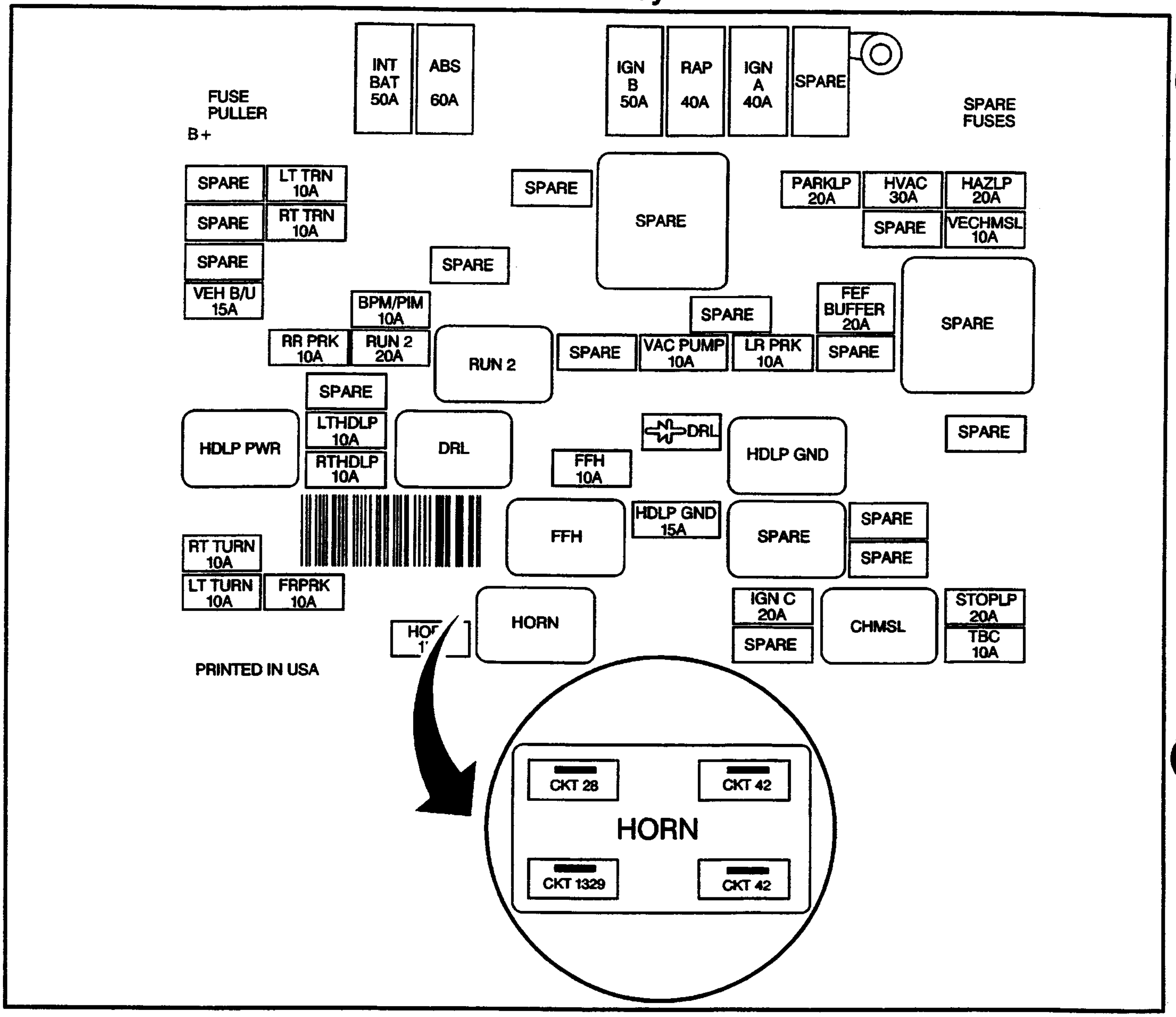
1. Lift Glass Relay
2. Courtesy Lamp Relay
3. Retained Accessory Power Relay
4. Power Seats Circuit Breaker
5. Power Windows Circuit Breaker
6. Inadvertent Power Relay
7. Door Lock Relay
8. Park Lamp Relay
9. Driver Door Unlock Relay
10. Door Unlock Relay

Underhood Bussed Electrical Center (UBEC)


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA

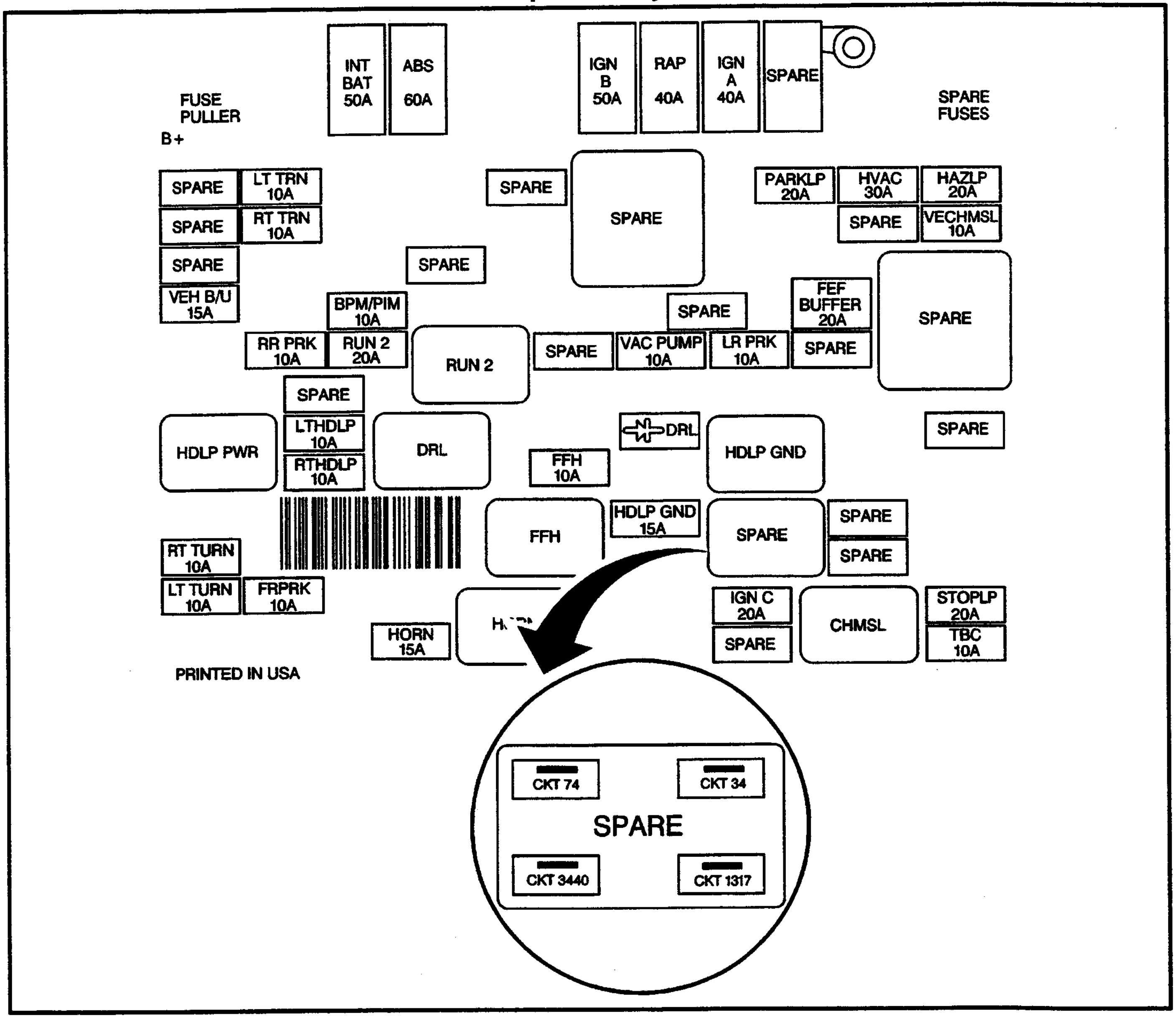
5308w3246

Horn Relay


FUSE
PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 28
CKT 42
HORN
CKT 1329
CKT 42

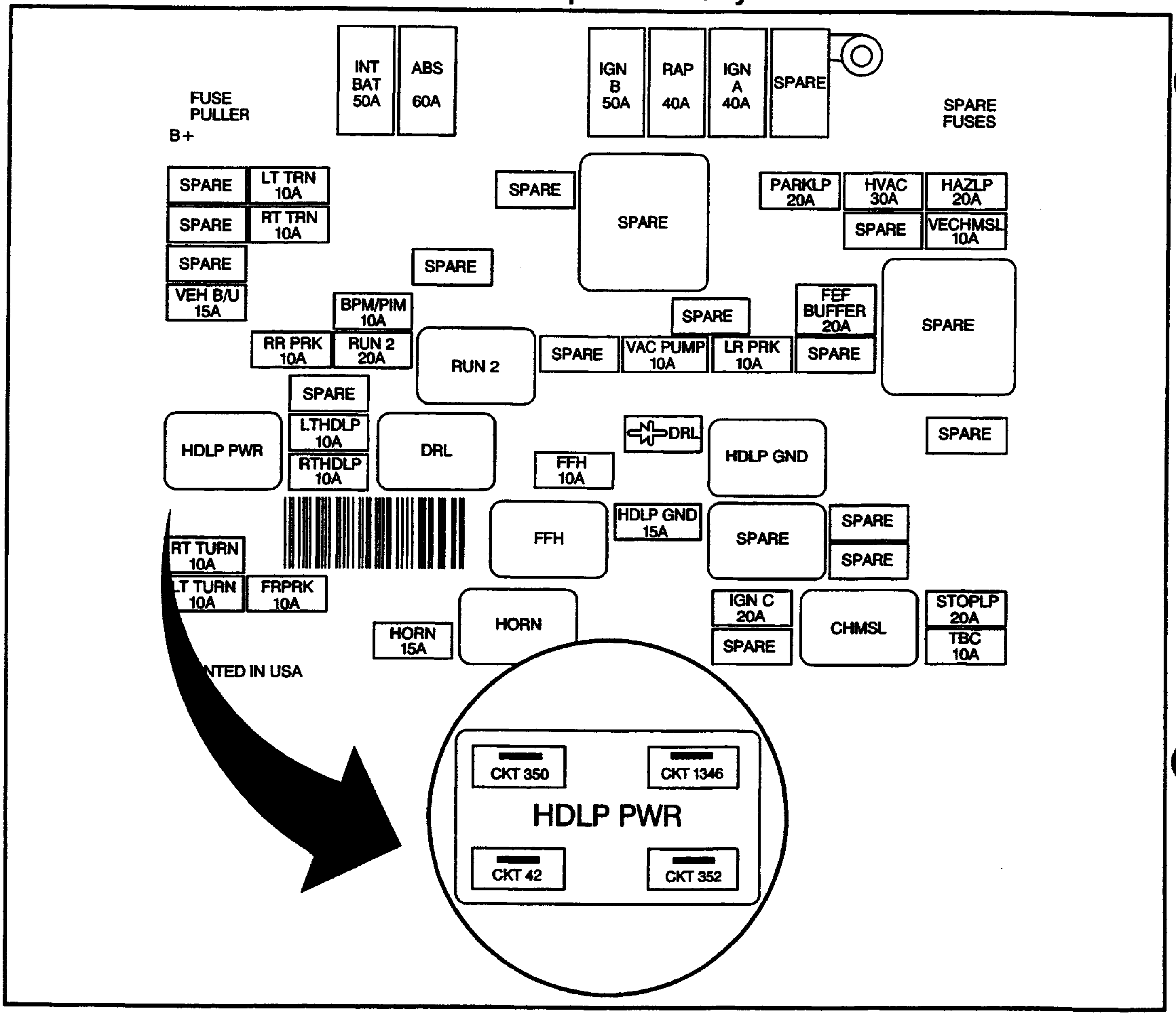
5308w3247

Spare Relay


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
SPARE
VAC PUMP 10A
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
FFH 10A
DRL
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 74
CKT 34
SPARE
CKT 3440
CKT 1317

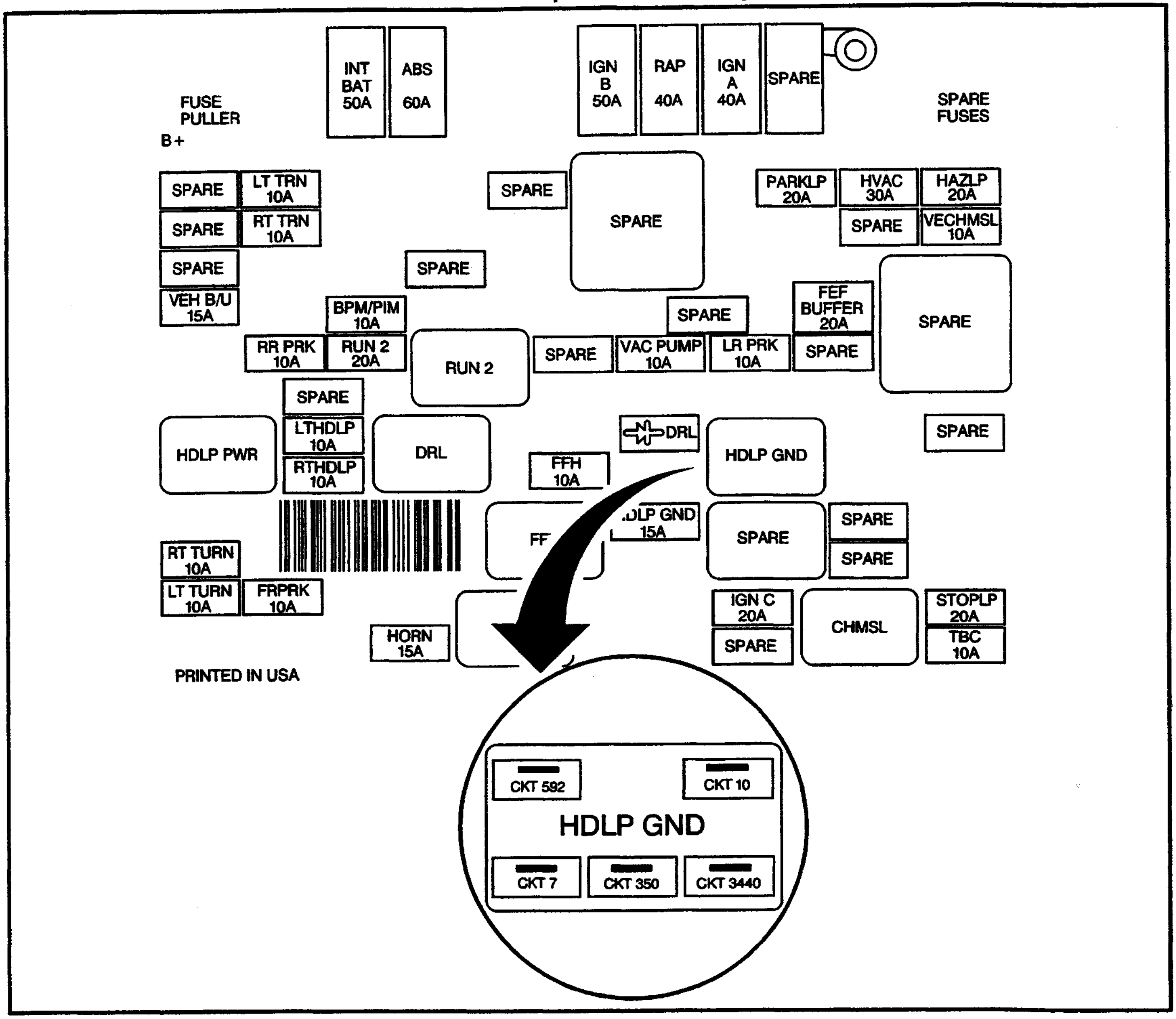
5308w3248

Head Lamp Power Relay


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
FFH 10A
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
NTED IN USA
CKT 350
CKT 1346
HDLP PWR
CKT 42
CKT 352

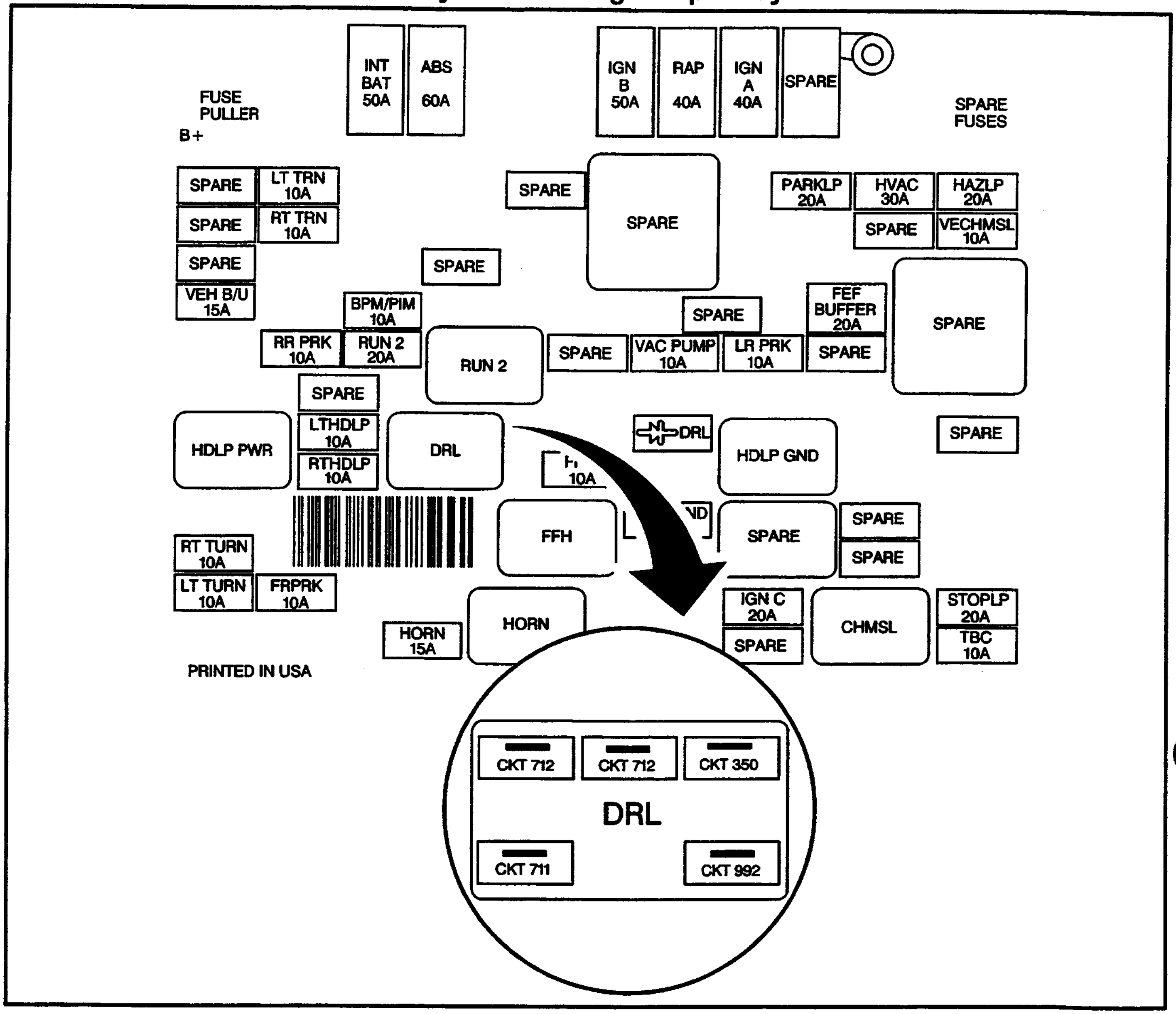
5308w3249

Head Lamp Ground Relay


INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
FUSE PULLER
B+
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
FFH 10A
DRL
HDLP GND
SPARE
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 592
CKT 10
HDLP GND
CKT 7
CKT 350
CKT 3440

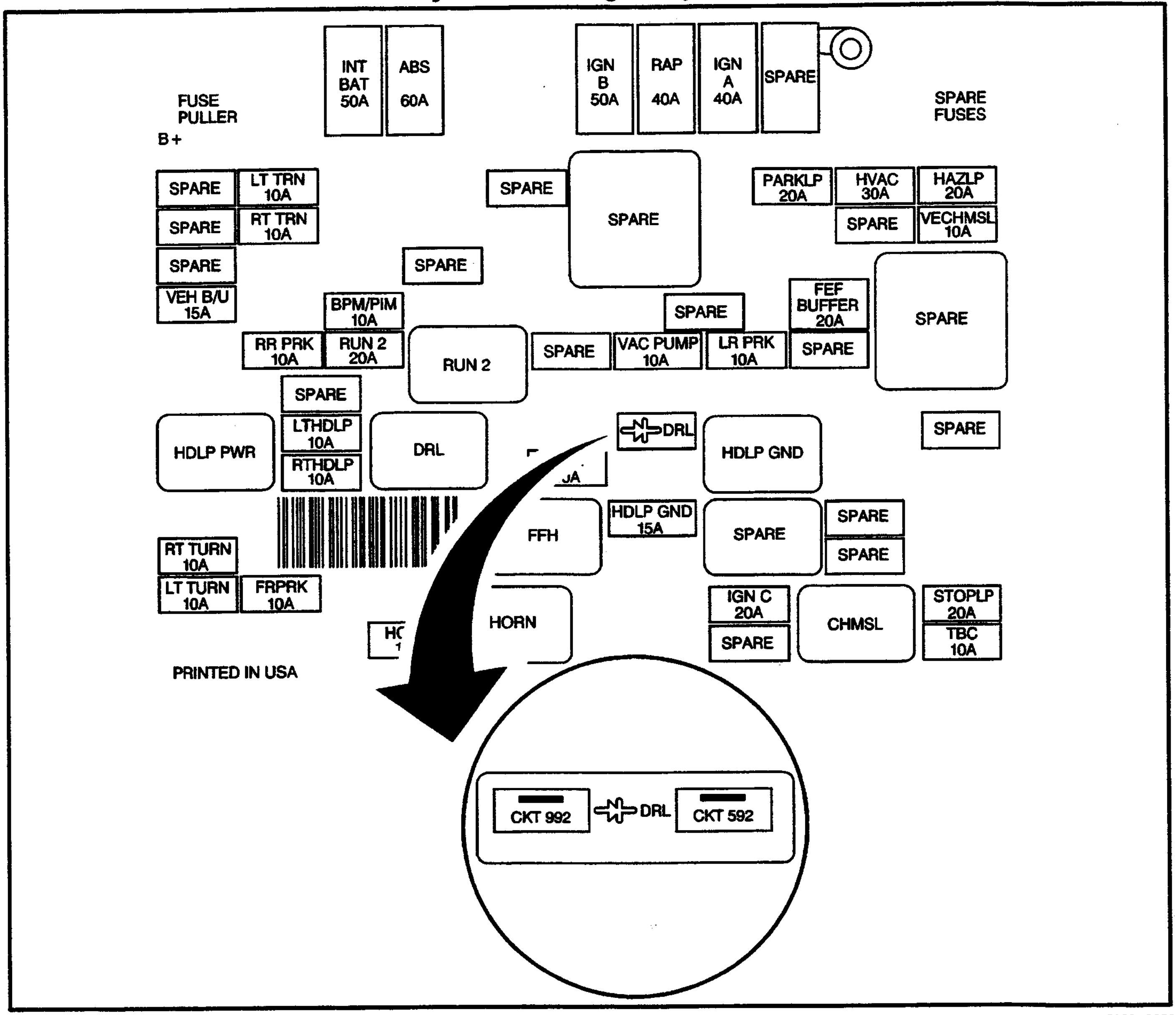
5308w3250

Daytime Running Lamp Relay


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
SPARE
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
LR PRK 10A
SPARE
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
HDLP GND
SPARE
10A
FFH
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
HORN 15A
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 712
CKT 712
CKT 350
DRL
CKT 711
CKT 992

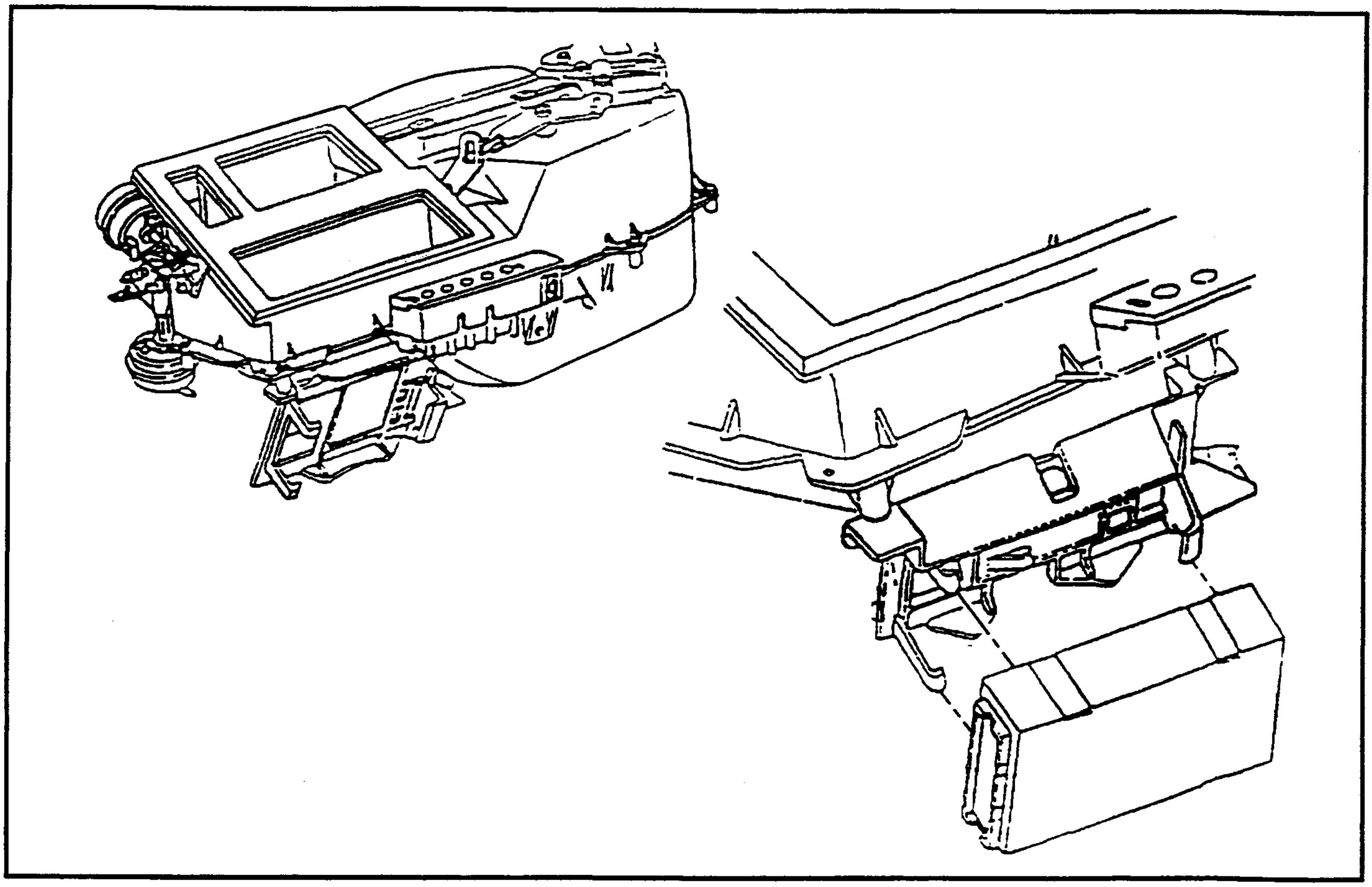
5308w3251

Daytime Running Lamp Diode


FUSE PULLER
B+
INT BAT 50A
ABS 60A
IGN B 50A
RAP 40A
IGN A 40A
SPARE
SPARE FUSES
SPARE
LT TRN 10A
SPARE
RT TRN 10A
SPARE
VEH B/U 15A
SPARE
SPARE
SPARE
PARKLP 20A
HVAC 30A
HAZLP 20A
SPARE
VECHMSL 10A
BPM/PIM 10A
RR PRK 10A
RUN 2 20A
RUN 2
SPARE
VAC PUMP 10A
SPARE
LR PRK 10A
FEF BUFFER 20A
SPARE
SPARE
SPARE
HDLP PWR
LTHDLP 10A
RTHDLP 10A
DRL
DRL
HDLP GND
SPARE
FFH
HDLP GND 15A
SPARE
SPARE
SPARE
RT TURN 10A
LT TURN 10A
FRPRK 10A
HORN
IGN C 20A
SPARE
CHMSL
STOPLP 20A
TBC 10A
PRINTED IN USA
CKT 992
DRL
CKT 592

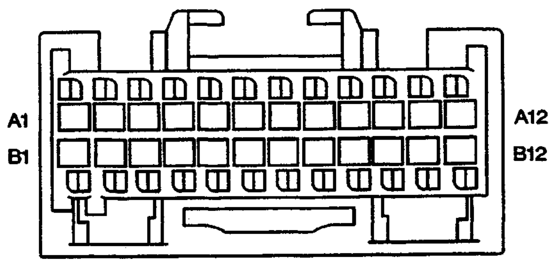
5308w3253

Truck Body Control Module Component Views



5008W2912

Truck Body Control Module Connector End Views



191572

TBC Connector C1

Connector Part Information			• 12160778 • 24 Way F Micro-Pack 100 Series (BROWN)			
Pin	**Wire Color**	**Circuit No.**	**Function**	**Component Connector Cavity**	**DTC(s) Affected**	**Possible Symptoms From a Faulty Circuit**
A1	BLK	1850	Ground	Spice Pack 202 Terminal A and G200 and G201	—	—
A2	ORN	1140	TBC Fuse	UBEC Connector C1 Terminal E1	—	Class 2 inoperative Scan Tool Will Not Communicate With TBC
A3	—	—	Not Used	—	—	—
A4	—	—	Not Used	—	—	—
A5	—	—	Not Used	—	—	—
A6	—	—	Not Used	—	—	—
A7	BLK	755	RAP Relay Coil	RAP Relay BBEC Terminal E2	B1477 B1478	RAP Relay Inoperative
A8	DK BLU	1393	Inadvertent Power Relay Coil	Inadvertent Power Relay BBEC Terminal C4	B1480	Battery Run Down Protection inoperative, Dome lamps or Courtesy Lamps Inoperative
A9	BLK	28	Horn Relay Coil	Horn Relay UBEC Connector C1 Terminal E3	B2752	Horn Relay Sticking or Panic alarm Inoperative

TBC Connector C1 (continued)

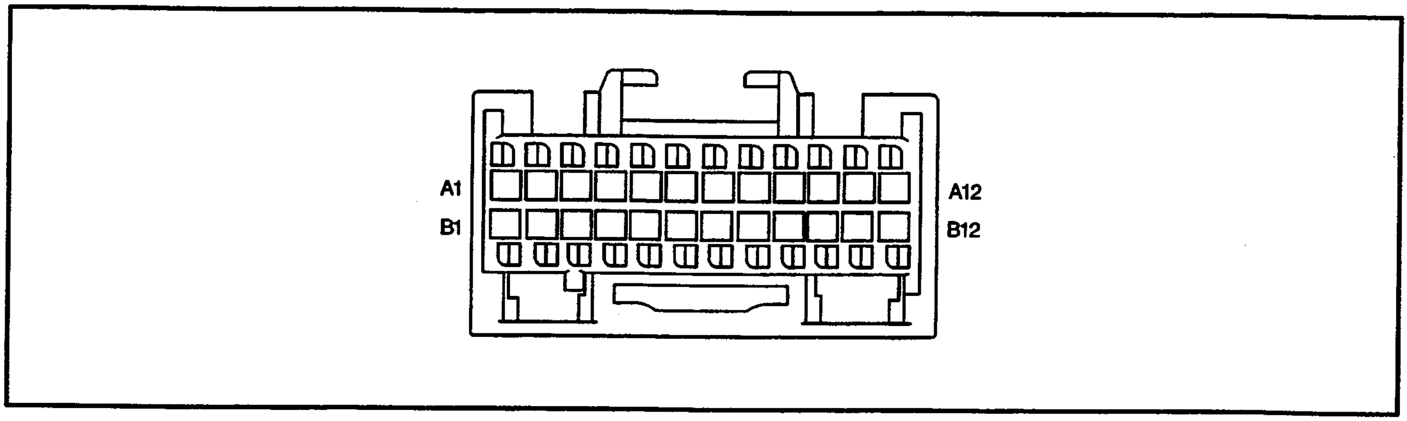
Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symptoms From a Faulty Circuit
A10	—	—	Not Used	—	—	—
A11	LT GRN/ BLK	592	Daytime Running Lamp Relay Coil	Daytime Running Lamp Relay UBEC Connector C1 Terminal A6	B2600	Daytime Running Lamps Inoperative
A12	LT GRN	1037	Class 2 Serial Data Signal	Splice Pack 201 Terminal M	U1301	No Start if circuit is shorted due to the passlock system
B1	BLK	1850	Ground	Spice Pack 202 Terminal A and G200 and G201	—	—
B2	PNK	39	Gauges Fuse	I/P Fuse Block Terminal J7 and C203 Terminal J1 and Ignition Switch for Ignition 1	B2961	No Start if circuit is shorted
B3	RED/WHT	812	Passlock Sensor Power	C211 Terminal C2 and Passlock Sensor	—	—
B4	—	—	Not Used	—	—	—
B5	—	—	Not Used	—	—	—
B6	LT BLU/ WHT	1414	Left Turn Signal Fuse	Splice Pack 204 Terminal E and UBEC Connector C1 Terminal F5	—	Turn Signal Reminder Inoperative or Turn Signals Inoperative due to a fuse malfunction
B7	DK BLU/ WHT	1415	Right Turn Signal Fuse	Splice Pack 204 Terminal H and UBEC Connector C1 Terminal F4	—	Turn Signal Reminder Inoperative or Turn Signals Inoperative due to a fuse malfunction

TBC Connector C1 (continued)

Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symptoms From a Faulty Circuit
B8	—	—	Not Used	—	—	—
B9	BRN	41	Cruise Fuse	I/P Fuse Block Terminal G7 and Splice Pack 200 Terminal B	—	—
B10	LT BLU	1134	Park Brake Switch Signal	Park Brake Switch Terminal A	—	Park Brake Telltale Inoperative
B11	BLK/WHT	238	Seat Belt Switch Signal	C317 Terminal E of 6-Way Connector and Seat Belt Switch Terminal C C207	—	Seat Belt Telltale Malfunction or Seat Belt Reminder Malfunction
B12	—	—	Not Used	—	—	—

(*) For more information refer to *Typical Scan Tool Data Values* within this section.

TBC Connector C2



Connector Part Information			• 12110206 • 24 Way F Micro-Pack 100 Series (LIGHT BLUE)			
Pin	**Wire Color**	**Circuit No.**	**Function**	**Component Connector Cavity**	**DTC(s) Affected**	**Possible Symptoms From a Faulty Circuit**
A1	YEL	710	Class 2 Serial Data Signal	Splice PACK SP201 Terminal J	—	Class 2 inoperative Scan Tool Will Not Communicate with TBC or BPCM
A2	ORN/BLK	1057	Passlock Sensor Return	C211 Terminal C4 and Passlock Sensor	—	—
A3	GRA/BLK	690	Courtesy Lamp Relay Coil	Courtesy Lamp Relay BBEC Terminal F4	B2617 B2618	Courtesy Lamp Relay Inoperative
A4	—	—	Not Used	—	—	—
A5	WHT	1080	Park Lamp Relay Coil	Park Lamp Relay BBEC Terminal A11	B2585	Park Lamp Relay Inoperative
A6	—	—	Not Used	—	—	—
A7	—	—	Not Used	—	—	—
A8	—	—	Not Used	—	—	—
A9	—	—	Not Used	—	—	—
A10	—	—	Not Used	—	—	—

TBC Connector C2 (continued)

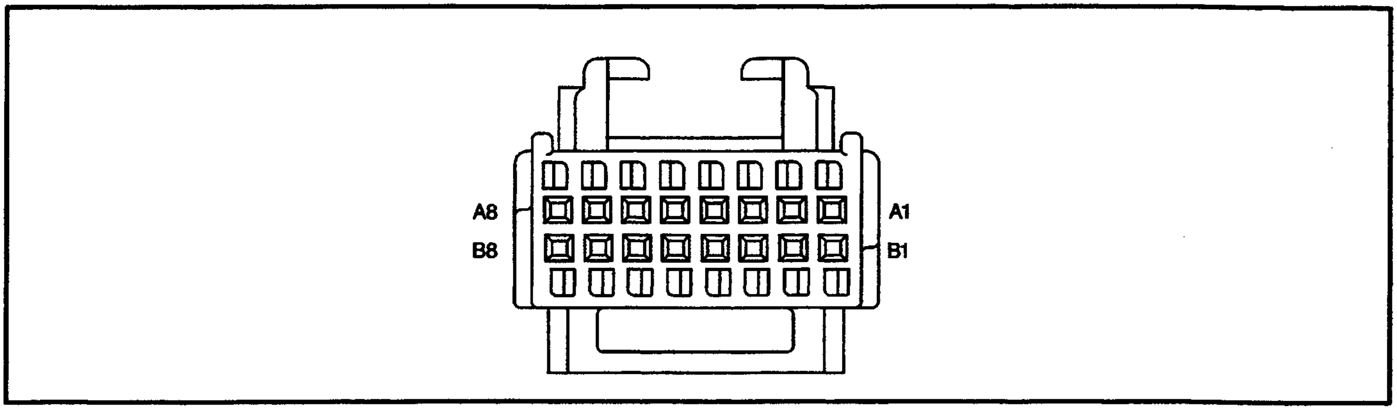
Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symptoms From a Faulty Circuit
A11	WHT	352	Head Lamp Power Relay Coil	UBEC Connector C1 Terminal C5 and C203 Terminal E12 and Head Lamp Switch Terminal C	B2575 B2577	Head Lamp Power Relay Inoperative and DRL's Inoperative
A12	PPL/WHT	1382	Dimming Signal	C203 Terminal G1 and Radio Connector C1 Terminal 6 and PSIR switch Terminal C	—	Dimming Inoperative with Park Lamps ON
B1	DK GRN/ WHT	817	Vehicle Speed Signal Input 4000 Pulses Per Mile	Splice Pack 200 Terminal E and Splice Pack 200 Terminal D and C106 Terminal N and Power Inverter Module (PIM) Connector C1 Terminal 4	—	Turn Signal Reminder Inoperative
B2	—	—	Not Used	—	—	—
B3	YEL	1836	Passlock Sensor Data	C211 Terminal D3 and Passlock sensor	—	—
B4	—	—	Not Used	—	—	—
B5	PPL	524	High / Low Beam Head Lamp Selector Switch Input	C211 Terminal E11 and UBEC Connector C1 Terminal A3	B2600	High Beams and High Beam Telltale Inoperative
B6	BRN	2409	ILLUM Fuse #12	C203 Terminal H9 and S283 and I/P Fuse Block Terminal N5	B2585	Head Lamp Reminder Inoperative
B7	—	—	Not Used	—	—	—
B8	—	—	Not Used	—	—	—

TBC Connector C2 (continued)

Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symptoms From a Faulty Circuit
B9	LT GRN	80	KEY IN / KEY OUT Signal	C211 Terminal B4 48-Way and Ignition Switch	B2961	No Exit Lighting or KEY IN Reminder
B10	—	—	Not Used	—	—	—
B11	DK BLU/ WHT	727	Passenger Door Jam Switch Signal	Right Door Jam Switch Terminal B	—	Interior Lighting Stays ON or Inoperative
B12	ORN	1732	Interior Lamp Request Input	Courtesy Lamp Relay and Inadvertent Power Relay BBEC Terminal E5	B1480 B2617	Battery Run Down Protection Inoperative

(*) For more information refer to *Typical Scan Tool Data Values* within this section.

TBC Connector C3



191574

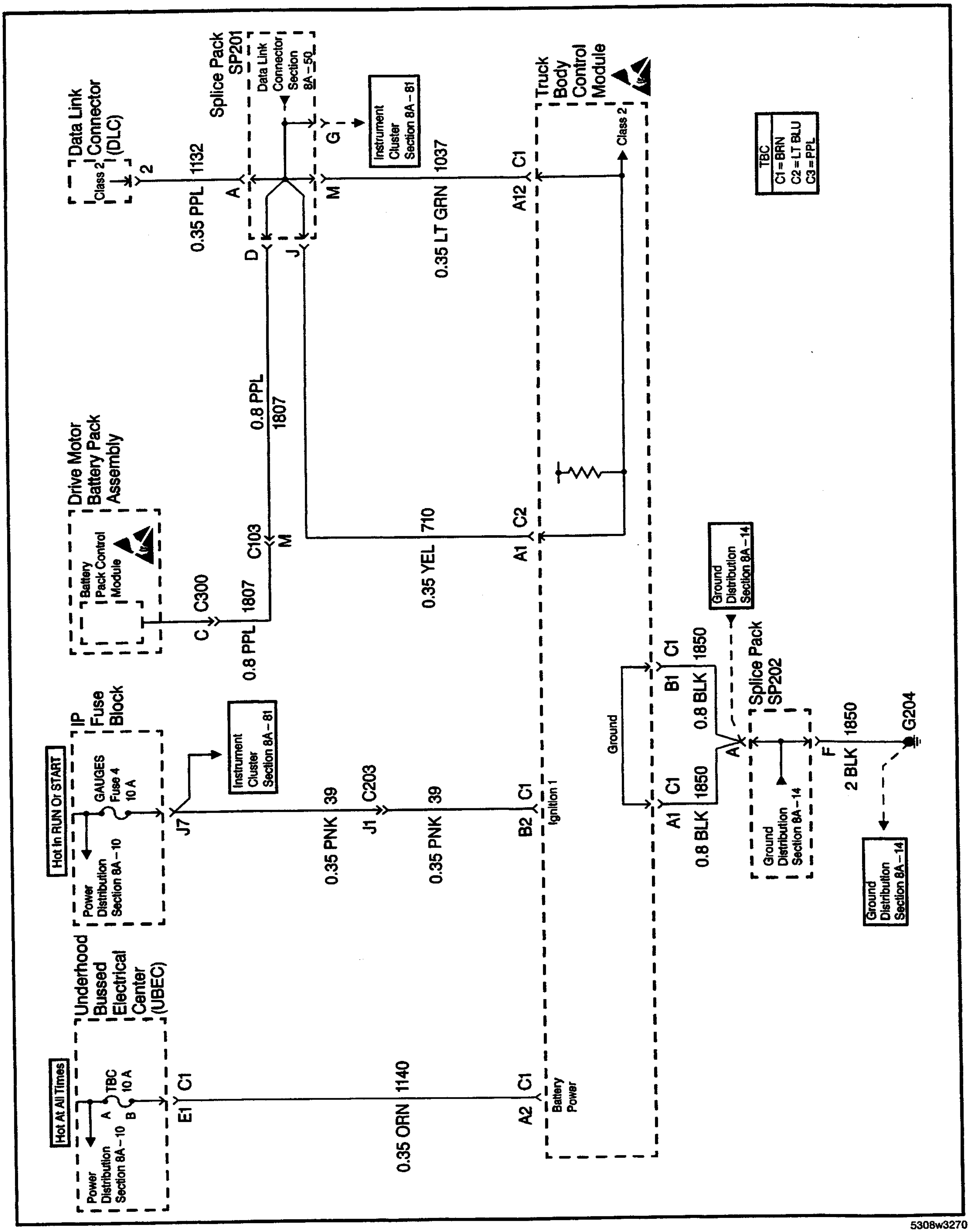
Connector Part Information	• 12191375 • 16 Way F Micro-Pack 100 Series (PURPLE)					
Pin	**Wire Color**	**Circuit No.**	**Function**	**Component Connector Cavity**	**DTC(s) Affected**	**Possible Symptoms From a Faulty Circuit**
A1	—	—	Not Used	—	—	—
A2	DK BLU/ WHT	1495	Dome Lamp Switch Request	Head Lamp Switch Terminal G	—	Manual Interior Lighting Request Inoperative
A3	—	—	Not Used	—	—	—
A4	GRA	705	5 Volt Reference	Ambient Light Sensor Terminal A	B1397 B1398 B2647 B2648	Head Lamps Will Stay ON During the Day
A5	GRA	1220	Dome Lamp Dimming Switch Power Input	I/P Fuse Block Illum Fuse #5	B2613	IPC Will Not Dim Properly When Dark Head Lamp Reminder Inoperative
A6	WHT	278	Ambient Light Photocell Signal Return	Ambient Light Sensor Terminal B	B1397 B1398 B2647 B2648	Head Lamps Will Turn ON Improper Operation of Auto Head Lamps and DRL's
A7	—	—	Not Used	—	—	—
A8	—	—	Not Used	—	—	—
B1	—	—	Not Used	—	—	—
B2	ORN	54	Right Door Jam Switch Signal	C203 Terminal G11 and Right Door Jam switch Terminal A	—	Illuminated Entry will not Function Properly

TBC Connector C3 (continued)

Pin	Wire Color	Circuit No.	Function	Component Connector Cavity	DTC(s) Affected	Possible Symptoms From a Faulty Circuit
B3	—	—	Not Used	—	—	—
B4	TAN	126	Driver Door Jam Switch Signal	Driver Door Jam Switch Terminal A	—	Illuminated Entry will not Function Properly
B5	—	—	Not Used	—	—	—
B6	PPL	328	Dome Override Switch	Head Lamp Switch Terminal J	—	Dome Lamp Override Switch Inoperative Dome Lamps will Turn ON when the Dome Override Switch is ON
B7	—	—	Not Used	—	—	—
B8	PPL/WHT	549	Head Lamp Request Switch Signal	Head Lamp Switch Terminal H	B2575 B2577	Manual Head Lamp Switch Position not recognized by the TBC (i.e. Manual Park Lamps and Head Lamps Inoperative)

(*) For more information refer to *Typical Scan Tool Data Values* within this section.

TBC System Check


Data Link Connector (DLC)
Class 2
2
0.35 PPL
1132
Splice Pack SP201
Data Link Connector Section 8A-50
A
M
G
D
J
Instrument Cluster Section 8A-81
0.35 LT GRN
1037
C1
A12
Truck Body Control Module
Class 2
TBC
C1=BRN
C2=LT BLU
C3=PPL
0.8 PPL
1807
Drive Motor Battery Pack Assembly
Battery Pack Control Module
C
C300
0.8 PPL
1807
C103
M
0.35 YEL
710
C2
A1
Ground Distribution Section 8A-14
Splice Pack SP202
B1
C1
1850
0.8 BLK
Ground
A
F
1850
2 BLK
G204
A1
C1
1850
0.8 BLK
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14
Hot In RUN Or START
IP Fuse Block
GAUGES Fuse 4 10 A
Power Distribution Section 8A-10
J7
Instrument Cluster Section 8A-81
0.35 PNK
39
C203
J1
0.35 PNK
39
C1
B2
Ignition 1
Hot At All Times
Underhood Bussed Electrical Center (UBEC)
TBC 10 A
A
B
Power Distribution Section 8A-10
C1
E1
0.35 ORN
1140
C1
A2
Battery Power

5308w3270

Circuit Description

The Truck Body Control Module (TBC) system check is a test to identify an electronic system malfunction. The TBC system check is the starting point for any Truck Body Control Module complaint. Understanding and using the TBC system check table will reduce diagnostic time and prevent the unnecessary replacement of parts.

Test Description

Step number(s) below refer to the same step number(s) in the TBC system check table.

1. Since most the diagnostic procedures require a scan tool, serial data must be available. Step 1 is a check to make sure communications can be established with the Truck Body Control Module.
2. Checks for serial data. When the scan tool can read data, the serial data line is OK.
3. This step Checks for class 2 communications with other systems. When the scan tool can read data, the class 2 serial data line is OK.
4. This step Checks for any open Truck Body Control Module power fuses.
5. This step tests the Truck Body Control Module power circuit. If the test light does not turn ON, there is a open in the power circuit.
6. This step tests the Truck Body Control Module ground circuit. If the test light does not turn ON, there is a open in the ground circuit.
7. This step determines if an open is present in the class 2 serial data line between the Truck Body Control Module and the DLC (circuit 1037).

Notice: After a repair is made that requires clearing DTC(s) from the Truck Body Control Module. The repair must be checked by operating the vehicle within the limits shown in *Conditions for Setting the DTC*, part of the DTC procedure. Operating the vehicle using the limits shown in the *Conditions for Setting the DTC* will check if the repair was made correctly.

13. Clear DTC(s) using the scan tool.

Notice: The Probing of electrical circuits without the use of Connector test adapter kit (J 35616-A) could cause damage to electrical components and connectors. ***Connector test adapter kit (J 35616-A) is the ONLY recommended method of probing connectors, terminals, and Bussed Electrical Centers. Connector test adapter kit (J 35616-A) contains an assortment of flexible connectors used to probe connectors, terminals, and Bussed Electrical Centers during diagnosis.***

TBC System Check

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the OFF position. 2. Connect the scan tool. 3. Turn the ignition switch to the RUN position. Do not start the engine. 4. Attempt to establish communications with the TBC. Does the scan tool communicate with the TBC?	—	Go to Step 2	Go to Step 3
2	Select display current DTC(s) with the scan tool. Are any current DTC(s) stored?	—	Go to *Applicable Diagnostic Trouble Code Table*	System Normal
3	Attempt to establish communications with other Class 2 systems (i.e. PIM, IPC, BPCM). Does the scan tool communicate with other Class 2 systems?	—	Go to Step 4	Go to *Section 8A-50. Scan Tool Does Not Communicate with Class 2 Data Line*

TBC System Check (continued)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to the RUN position. Do not start the engine. 2. Connect a test light to a good ground. 3. Probe both sides of all TBC power feed fuses with the test light. Does the test light turn ON for all circuits?	—	Go to Step 5	Go to Step 9
5	1. Turn the ignition switch to the OFF position. 2. Disconnect the TBC connectors C1, C2, and C3. 3. Turn the ignition switch to the RUN position. 4. Connect a test light to a good ground. 5. Probe both sides of all TBC power feed fuses with the test light. 6. Probe the Brown TBC connector at the terminals for the power feed fuses with the test light. Does the test light turn ON for all power feed circuits?	—	Go to Step 6	Go to Step 11
6	1. Connect a test light to B+. 2. Probe all TBC ground circuits with the test light. Does the test light turn ON for all ground circuits?		Go to Step 7	Go to Step 12
7	Check for continuity between the TBC connector C1 terminal A12 (harness side) and the DLC connector terminal 2. Is there continuity?		Go to Step 8	Go to Step 10
8	1. Replace the TBC. 2. Program the TBC with the proper calibrations. Is the repair complete?		Go to Step 13	—
9	1. Repair the open in the ignition feed or battery feed circuit to the TBC power feed fuse(s). 2. If a fuse was open, locate and repair the short in the circuit connected to the open fuse. Is the repair complete?		Go to Step 13	—
10	Locate and repair the open in circuit 1037. Is the repair complete?		Go to Step 13	—
11	Locate and repair the open in the TBC power circuit. Is the repair complete?		Go to Step 13	—
12	Locate and repair the open in the TBC ground circuit. Is the repair complete?		Go to Step 13	—
13	1. Turn the ignition switch to the OFF position. 2. Connect or install any components or connectors that were disconnected or removed. 3. Clear all DTC(s). Refer to *Clearing DTC(s).* Are all DTC(s) cleared?		System OK	Go to *Applicable Diagnostic Trouble Code Table*

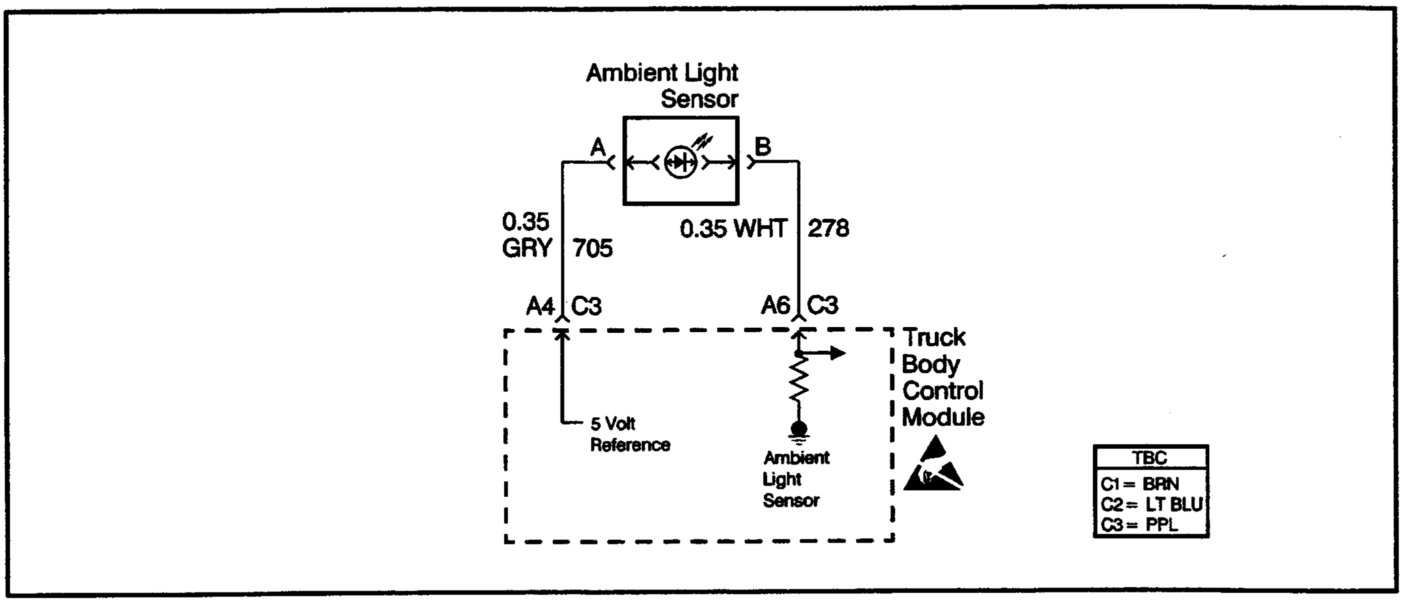
Truck Body Control Module Diagnostic Trouble Code List

DTC	Description	MIL Illuminated
B1397	5 Volt Reference Circuit Low	—
B1398	5 Volt Reference Circuit High	—
B1477	Retained Accessory Power Circuit Low	—
B1478	Retained Accessory Power Circuit High	—
B1480	Inadvertent Power Circuit Malfunction	—
B2575	Head Lamp Request / Feedback Mismatch	—
B2577	Head Lamp Control Circuit Low	—
B2585	Park Lamp Control Circuit Malfunction	—
B2600	Daytime Running Lamp Circuit	—
B2613	Dimming Potentiometer Circuit High	—
B2617	Courtesy Lamp Circuit Low	—
B2618	Courtesy Lamp Circuit High	—
B2647	Ambient Light Sensor Circuit Low	—
B2648	Ambient Light Sensor Circuit High	—
B2752	Horn Relay Coil Circuit Low	—
B2961	Ignition 1 - Key In / Out Mismatch	—
U1255	Class 2 Communication Malfunction. Refer to Section 8A-50.	—
U1301	Class 2 Data Link High. Refer to Section 8A-50.	—

Symptom Subsection References

Symptom	Subsection Reference
Power Distribution Malfunction	8A-10 Power Distribution
Power Distribution Malfunction	8A-11 Fuse Block Details
Ground Distribution Malfunction	8A-14 Ground Distribution
Retained Accessory Power Malfunction	8A-15 Retained Accessory Power
Drive Motor Control Module (DMCM) Malfunction	8A-20 - Drive Motor Unit
Data Link Connector (DLC) Malfunction	8A-50 - Data Link Connector (DLC)
Truck Body Control Module (TBC) Malfunction	8A-51 - Truck Body Control Module
Audible Warning Malfunction	8A-76 Audible Warnings
Instrument Panel Cluster (IPC)	8A-81 Instrument Panel Cluster (IPC)
Head Lamps Malfunction	8A-102 Head Lamps
Daytime Running Lamps Malfunction	8A-102 Head Lamps
Exterior Lights Malfunction	8A-110 Exterior Lights
Backup Lights Malfunction	8A-112 Backup Lights
Interior Lights Malfunction	8A-114 Interior Lights
Interior Lights Dimming Malfunction	8A-117 Interior Lights Dimming
Column/Ignition Lock Malfunction	8A-139 Column/Ignition Lock
Radio/Audio Systems Malfunction	8A-150 Radio/Audio Systems

DTC B1397 - 5 Volt Reference Circuit Low



GG 260630

Circuit Description

The light sensor is an input to the TBC. The TBC uses the light sensor input to determine the level of light. During the day (LIGHT State) the automatic head lamps will be OFF. During the night (Dark State) the automatic head lamps will be ON. The TBC will use the light sensor to turn the head lamps ON automatically at night. The TBC Monitors the 5 volt reference circuit to the light sensor. When the TBC does not see 5 volts on this circuit it will set a related DTC. The TBC also monitors the ignition switch position based on ignition signal inputs. The TBC performs a self test on power up.

Conditions for Setting the DTC

- When circuit 705 is shorted to ground or circuit 278 is shorted to ground.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- Automatic headlight control will turn ON.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- If the reference voltage is above 5.25 volts Go To Table DTC B1398 first.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

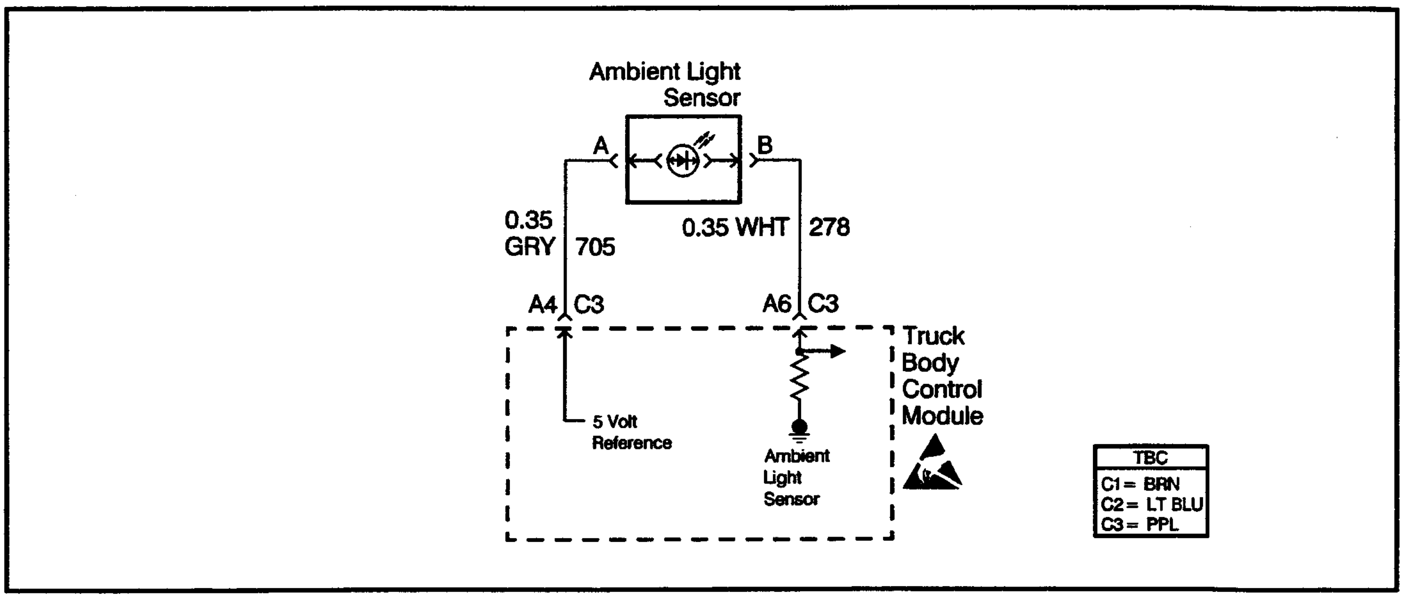
Number(s) below refer to the step number(s) on the Diagnostic Table.

2. This checks the TBC 5 volt reference output voltage to the light sensor.
5. This checks the 5 volt reference output voltage for a short to ground.

DTC B1397 - 5 Volt Reference Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. DTC B1397 should be a current code before performing this table. 2. Turn the ignition switch to the RUN position. 3. Using a DMM, backprobe between Purple TBC connector at terminal A4 and a good ground. Is the voltage within the specified value?	4.75 Volts to 5.25 Volts	DTC B1397 is intermittent. Refer to *Diagnostic Aids*	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the Purple TBC connector. 3. Check for a good connection from terminal A4 of the Purple TBC connector and the TBC using the Packard Terminal Repair Kit J 38125-A. Is there a good connection?	—	Go to Step 4	Go to Step 7
4	1. Connect the Purple TBC connector. 2. Clear DTCs. 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B1397 set as a current code?	—	Go to Step 5	Go to Step 8
5	1. Turn the ignition switch to the RUN position. 2. Using a DMM, backprobe the Purple TBC connector at pin A4 and a good ground. Does the DMM indicate a short to ground?	—	Go to Step 8	Go to Step 6
6	1. Replace the TBC. 2. Program the TBC with the proper calibrations. Is the repair complete?	—	Go to Step 13	—
7	Repair Connection at terminal A4. Refer to *Repair Procedures*, Section 8A-5. Is the repair complete?	—	Go to Step 13	—
8	1. Disconnect the light sensor. 2. Turn the ignition switch to the OFF position. 3. Using a DMM, check the light sensor circuit 705 for a short to ground or an open. Is circuit 705 shorted to ground or open?	—	Go to Step 10	Go to Step 11
9	Replace the light sensor. Is the repair complete?	—	Go to Step 13	—
10	Repair short to ground or open in circuit 705 between the Purple TBC connector and the light sensor. Is the repair complete?	—	Go to Step 13	—
11	Check for a short to ground in circuit 278 between the Purple TBC connector and the light sensor. Was a short to ground found?	—	Go to Step 12	Go to Step 9
12	Repair short to ground in circuit 278 between the Purple TBC connector and the light sensor. Is the repair complete?	—	Go to Step 13	—
13	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B1398 - 5 Volt Reference Circuit High



GG 260630

Circuit Description

The light sensor is an input to the TBC. The TBC uses the light sensor input to determine the level of light. During the day (LIGHT State) the automatic head lamps will be OFF. During the night (Dark State) the automatic head lamps will be ON. The TBC will use the light sensor to turn the head lamps ON automatically at night. The TBC Monitors the 5 volt reference circuit to the light sensor. When the TBC does not see 5 volts on this circuit it will set a related DTC. The TBC also monitors the ignition switch position based on ignition signal inputs. The TBC performs a self test on power up.

Conditions for Setting the DTC

- When circuit 705 is shorted to battery voltage.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- Automatic headlight control will turn ON.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- The light sensor values on the scan tool should change when the light sensor is disconnected.
- Perform a visual check of the wiring and connectors
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

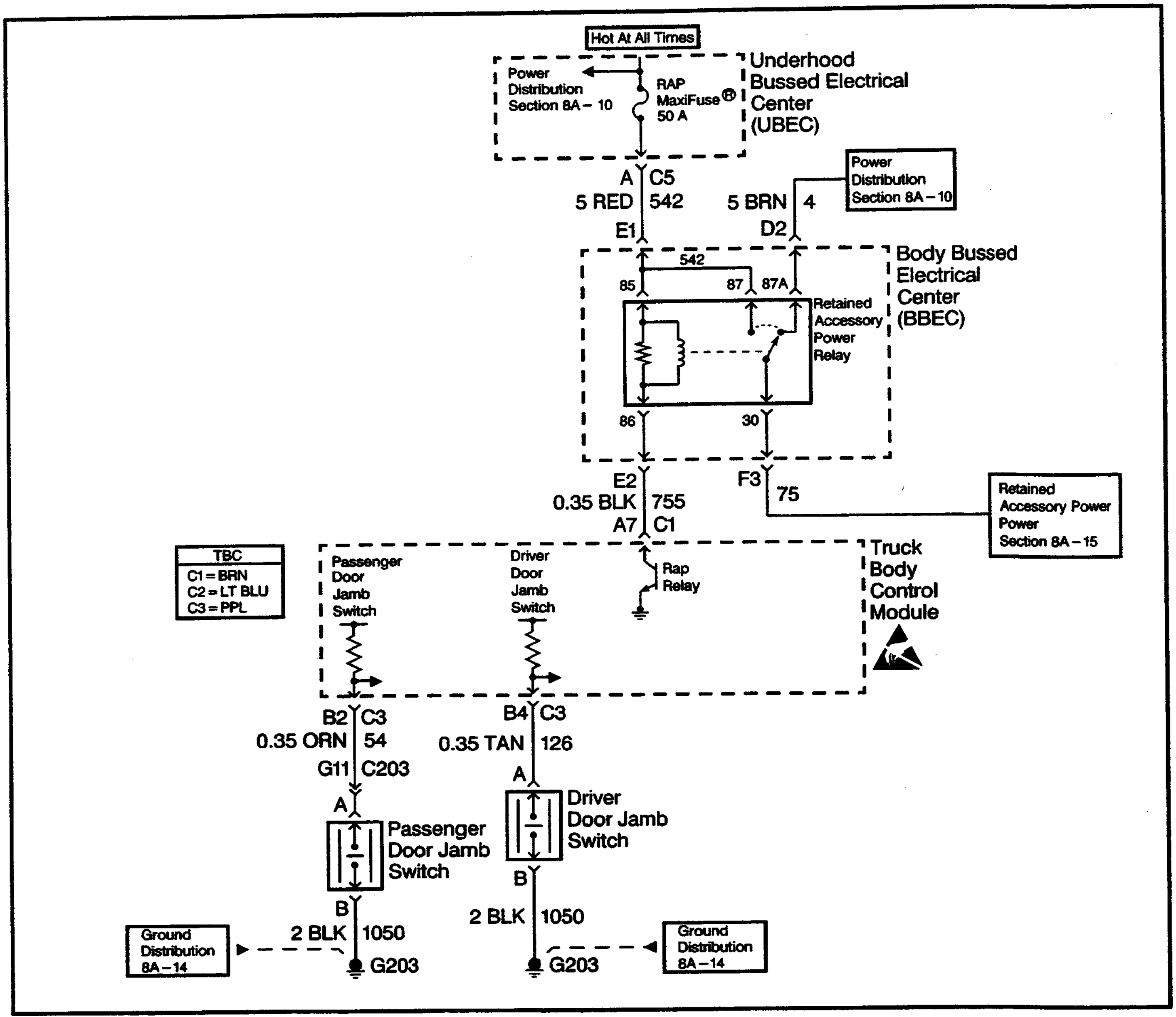
Number(s) below refer to the step number(s) on the Diagnostic Table.

5. This checks the TBC 5 volt reference voltage to the light sensor.
8. This checks the 5 volt reference circuit for a short to battery voltage.

DTC B1398 - 5 Volt Reference Circuit High

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. DTC B1398 should be a current code before performing this table. 2. Turn the ignition switch to the RUN position. 3. Using a DMM, backprobe between Purple TBC connector at terminal A4 and a good ground. Is the voltage above the specified value?	5.25 Volts	Go to Step 3	DTC B1398 is intermittent. Refer to *Diagnostic Aids*.
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the Purple TBC connector. 3. Check for a good connection from terminal A4 of the Purple TBC connector and the TBC using the Packard Terminal Repair Kit J 38125-A. Is there a good connection?	—	Go to Step 4	Go to Step 7
4	1. Connect the Purple TBC connector. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B1398 set as a current code?	—	Go to Step 5	Go to Step 8
5	1. Turn the ignition switch to the RUN position. 2. Using a DMM, backprobe the Purple TBC connector at pin A4 and a good ground. Is the voltage at or above the specified value?	5.25 Volts	Go to Step 8	Go to Step 6
6	1. Replace the TBC. 2. Program the TBC with the proper calibrations. Is the repair complete?	—	Go to Step 13	—
7	Repair Connection at terminal A4. Refer to *Repair Procedures*, Section 8A-5. Is the repair complete?	—	Go to Step 13	—
8	1. Disconnect The Light Sensor. 2. Turn The Ignition Switch to the OFF Position. 3. Using A DMM, check the light sensor circuit 705 for a short to voltage. Is Circuit 705 Shorted To voltage?	—	Go to Step 10	Go to Step 11
9	Replace the light sensor. Is the repair complete?	—	Go to Step 13	—
10	Repair short to voltage in circuit 705 between the Purple TBC connector and the light sensor. Is the repair complete?	—	Go to Step 13	—
11	Check for a short to voltage in circuit 278. Was a short to voltage found?	—	Go to Step 12	Go to Step 9
12	Repair short to voltage in circuit 278. Is the repair complete?	—	Go to Step 13	—
13	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B1477 - Retained Accessory Power Circuit Low


Hot At All Times
Power Distribution Section 8A- 10
RAP MaxiFuse® 50 A
Underhood Bussed Electrical Center (UBEC)
A C5
5 RED 542
E1
5 BRN 4
D2
Power Distribution Section 8A-10
542
85
87
87A
Retained Accessory Power Relay
Body Bussed Electrical Center (BBEC)
86
30
E2
0.35 BLK 755
A7 C1
F3
75
Retained Accessory Power Power Section 8A-15
TBC
C1 = BRN
C2 = LT BLU
C3 = PPL
Passenger Door Jamb Switch
Driver Door Jamb Switch
Rap Relay
Truck Body Control Module
B2 C3
0.35 ORN 54
G11 C203
A
Passenger Door Jamb Switch
B
2 BLK 1050
G203
B4 C3
0.35 TAN 126
A
Driver Door Jamb Switch
B
2 BLK 1050
G203
Ground Distribution 8A-14
Ground Distribution 8A-14
5308w3275

Circuit Description

The TBC monitors the voltage on circuit 755. If the TBC does not command the RAP relay ON and the key is in the OFF position with the door OPEN and the voltage on circuit 755 is low the TBC will set a related DTC. The TBC uses circuit 755 to turn ON the RAP relay. The TBC also monitors the ignition switch position based on ignition signal inputs. The TBC performs a self test on power up.

Conditions for Setting the DTC

- The RAP relay signal from the TBC remains low with the ignition switch OFF and the door OPEN.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The RAP circuit will not function correctly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

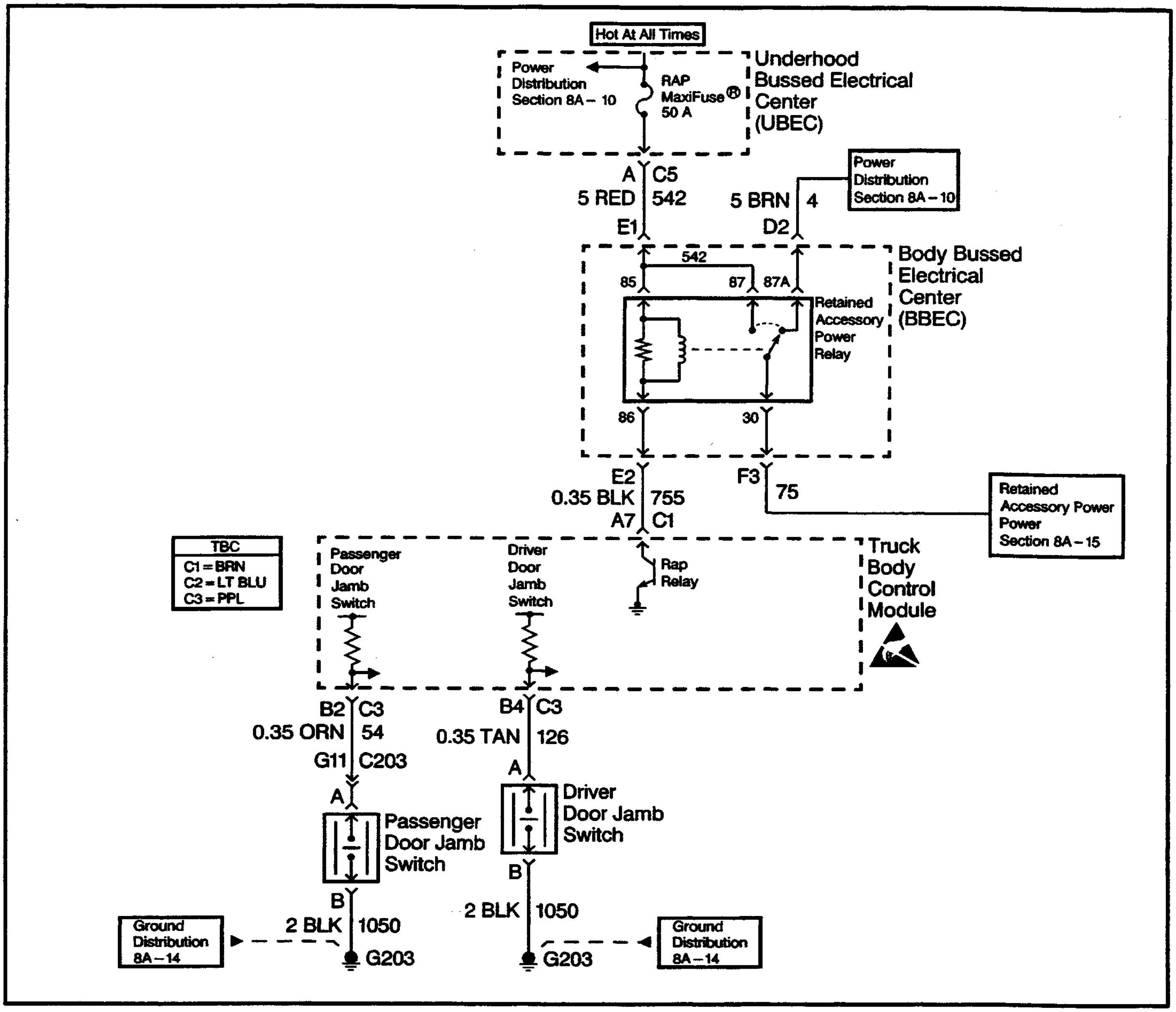
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

3. This step checks for a short to ground to the RAP relay.

DTC B1477 - Retained Accessory Power Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	Check RAP maxi fuse. Is it OK?	—	Go to Step 3	Go to Step 6
3	1. Turn the ignition switch to the OFF position. 2. Remove key from Ignition. 3. Open door (RAP OFF). 4. Disconnect Brown TBC connector. 5. Remove RAP relay from BBEC. 6. Using a DMM, measure resistance between Brown TBC connector at terminal A7 and a good ground. Does DMM display OL (Infinite)?	—	Go to Step 4	Go to Step 7
4	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position. 4. Open door. 5. Close both doors. 6. Turn the ignition switch to the RUN position. Is DTC B1477 set as a current code?	—	Go to Step 5	DTC B1477 is intermittent. Refer to *Diagnostic Aids.*
5	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 10	—
6	Make sure circuit 542 is not shorted to ground (repair as necessary) and replace RAP maxi fuse. Is the repair complete?	—	Go to Step 10	—
7	1. Disconnect BBEC connector. 2. Measure resistance between Brown TBC connector at terminal A7 and a good ground. Does DMM display OL (Infinite)?	—	Go to Step 8	Go to Step 9
8	Replace BBEC. Is the repair complete?	—	Go to Step 10	—
9	Repair the short to ground in circuit 755. Is repair complete?	—	Go to Step 10	—
10	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B1478 - Retained Accessory Power Circuit High


Hot At All Times
Power Distribution Section 8A – 10
RAP MaxiFuse® 50 A
Underhood Bussed Electrical Center (UBEC)
A C5
5 RED 542
E1
5 BRN 4
D2
Power Distribution Section 8A – 10
542
85
87
87A
Retained Accessory Power Relay
Body Bussed Electrical Center (BBEC)
86
30
E2
0.35 BLK 755
A7 C1
F3
75
Retained Accessory Power Power Section 8A – 15
TBC
C1 = BRN
C2 = LT BLU
C3 = PPL
Passenger Door Jamb Switch
Driver Door Jamb Switch
Rap Relay
Truck Body Control Module
B2 C3
0.35 ORN 54
G11 C203
A
Passenger Door Jamb Switch
B
2 BLK 1050
G203
Ground Distribution 8A – 14
B4 C3
0.35 TAN 126
A
Driver Door Jamb Switch
B
2 BLK 1050
G203
Ground Distribution 8A – 14

5308w3275

Circuit Description

The TBC monitors the voltage on circuit 755. If the TBC commands the RAP relay ON and the key is in the RUN position and then turned to the OFF position with the door CLOSED and the voltage on circuit 755 is high the TBC will set a related DTC. The TBC uses circuit 755 to turn ON the RAP relay. The TBC also monitors the ignition switch position based on ignition signal inputs. The TBC performs a self test on power up.

Conditions for Setting the DTC

- The RAP relay signal from the TBC remains high.
- The ignition switch is turned from the RUN position to the OFF position with the door CLOSED.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The RAP system will not function properly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

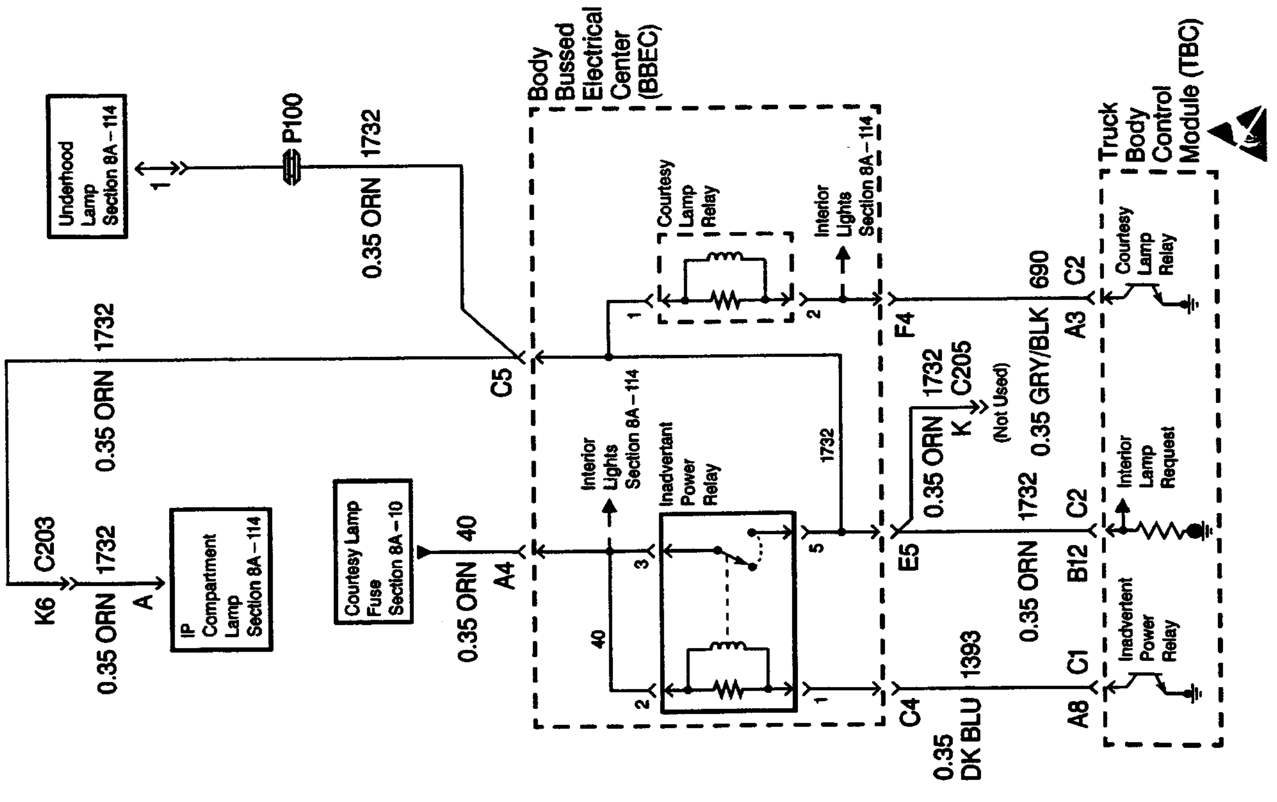
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

2. This step checks for a short to battery voltage to the RAP circuit relay.
3. This step checks the RAP relay.

DTC B1478 - Retained Accessory Power Circuit High

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Turn the ignition switch to the OFF position. 2. Remove the key from the Ignition switch. 3. Open door. (RAP OFF) 4. Disconnect Brown TBC connector. 5. Remove RAP relay from BBEC. 6. Measure voltage between Brown TBC connector from terminal A7 to a good ground using a DMM. Does DMM display approximately battery voltage?	—	Go to Step 7	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Using a DMM, measure the resistance between the RAP relay terminals 85 and 87. Is the resistance at or below the specified value?	5 ohms	Go to Step 8	Go to Step 4
4	1. Turn the ignition switch to the OFF position. 2. Using a DMM, measure the resistance between the RAP relay terminals 85 and 87A. Is the resistance at or below the specified value?	5 ohms	Go to Step 8	Go to Step 5
5	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B1478 set as a current code?	—	Go to Step 6	DTC B1478 is intermittent. Refer to *Diagnostic Aids.*
6	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 9	—
7	Repair short to voltage in circuit 755. Is the repair complete?	—	Go to Step 9	—
8	Replace the RAP Relay. Is the repair complete?	—	Go to Step 9	—
9	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B1480 - Inadvertent Power Circuit Malfunction


Underhood Lamp Section 8A-114
1
P100
1732
0.35 ORN
Body Bussed Electrical Center (BBEC)
Courtesy Lamp Relay
Interior Lights Section 8A-114
1
2
C5
0.35 ORN
1732
K6
C203
1732
0.35 ORN
A
IP Compartment Lamp Section 8A-114
Courtesy Lamp Fuse Section 8A-10
40
0.35 ORN
A4
Interior Lights Section 8A-114
Inadvertant Power Relay
1732
3
5
40
2
1
F4
E5
C4
0.35 DK BLU
1393
1732
C205
0.35 ORN
K
(Not Used)
0.35 GRY/BLK
690
A3
C2
1732
0.35 ORN
C2
B12
C1
A8
Truck Body Control Module (TBC)
Courtesy Lamp Relay
Interior Lamp Request
Inadvertent Power Relay

5308w3281

Circuit Description

The TBC monitors the voltage on circuit 1732 as an input. The TBC will set DTC B1480 when the voltage on circuit 1732 is low and the TBC is commanding circuit 1393 low. The TBC uses circuit 1393 to turn the inadvertent power relay ON. Before the TBC goes to sleep it turns OFF the inadvertent power relay. The TBC also monitors the ignition switch position based on ignition signal inputs.

Conditions for Setting the DTC

- When the TBC is commanding circuit 1393 to ground and the TBC receives a low input on circuit 1732 or a short to ground on circuit 1732.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The dome lamp, glove box lamp, inside rear view mirror lamps, reading lamps, under hood lamp, and vanity lamps will be disabled.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Check for an open in circuit 40 or an open CTSY LP fuse.
- Check for a loose or poor connection between the Body Harness and the BBEC.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table .

2. Checks the CTSY LP fuse.
3. Checks the control circuit for the inadvertent power relay.
4. Checks the power circuit for the inadvertent power relay.
6. Checks the inadvertent power relay.
11. Checks circuit 40 for a short to ground.
12. Checks circuit 40 for an open.
16. Checks circuit 1393 for an open between the inadvertent power relay and the TBC.
17. Checks the BBEC for an open.
18. Checks for a loose or a poor connection at the BBEC.

DTC B1480 - Inadvertent Power Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Make sure DTC B1480 is a Current Code. 2. Check the CTSY LP fuse. Is the fuse OK?	10 Amp Fuse #8	Go to Step 3	Go to Step 11
3	1. Turn the Ignition switch to the RUN position then to the OFF position. 2. Install a scan tool. 3. Using a scan tool, make sure the inadvertent power relay is ON. Is the inadvertent power relay is ON?	—	Go to Step 24	Go to Step 4
4	1. Remove inadvertent power relay from BBEC. 2. Turn the ignition switch to the RUN position. 3. Measure voltage between the BBEC cavity for the inadvertent power relay circuit 40 and ground. Is it approximately battery voltage?	—	Go to Step 5	Go to Step 12

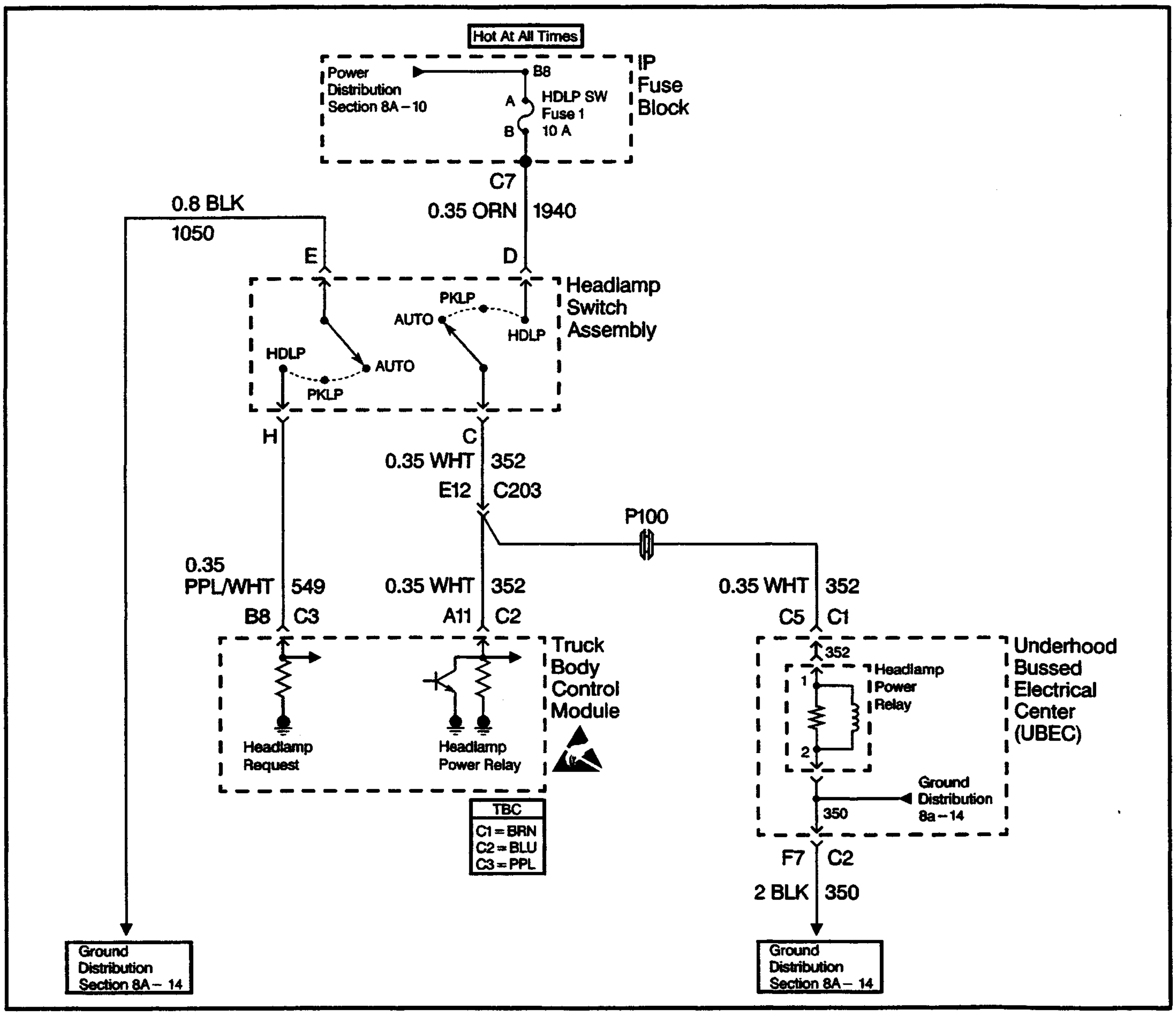
DTC B1480 - Inadvertent Power Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
5	Measure resistance between the inadvertent power relay terminals 1 and 2. Is the resistance at or near the specified value?	95 ohms	Go to Step 6	Go to Step 15
6	1. Disconnect the Brown TBC connector. 2. Measure the resistance between the BBEC cavity for the inadvertent power relay circuit 1393 and the Brown TBC connector terminal A8. Is the resistance at or below the specified value?	2 ohms	Go to Step 7	Go to Step 16
7	1. Connect a fused jumper wire to battery voltage and to the inadvertent power relay terminal 2. 2. Connect the inadvertent power relay terminal 1 to ground to energize relay. 3. Measure resistance between relay terminals 3 and 5. Is the resistance at or near the specified value?	2 ohms	Go to Step 8	Go to Step 21
8	Check for a poor connection from the inadvertent power relay to BBEC. Was a good connection found?	—	Go to Step 9	Go to Step 22
9	1. Re-connect all components and wiring. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. 5. Check for current DTC(s). Is DTC B1480 set as a current code?	—	Go to Step 10	DTC B1480 is intermittent. Refer to *Diagnostic Aids.*
10	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 25	—
11	1. Make sure circuit 40 is not shorted to ground (repair as necessary) and replace the CTSY LP fuse. Refer to *Power Distribution Section 8A-10* for schematics. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B1480 set as a current code?	—	Go to Step 23	Go to Step 25
12	1. Disconnect the BBEC connector. 2. Measure voltage between BBEC connector terminal A4 and ground. Is it approximately battery voltage ?	—	Go to Step 14	Go to Step 13
13	Repair open in circuit 40. Refer to *Power Distribution Section 8A-10* for schematics. Is repair complete?	—	Go to Step 25	—

DTC B1480 - Inadvertent Power Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
14	1. Check for a poor or a loose connection at the BBEC connector on terminal A4. 2. Repair as necessary. Was a repair necessary?	—	Go to Step 5	Go to Step 20
15	Replace the inadvertent power relay. Is repair complete?	—	Go to Step 25	—
16	1. Disconnect the BBEC connector. 2. Measure the resistance between the BBEC connector terminal C4 and the Brown TBC connector C1 terminal A8. Is the resistance at or below the specified value?	2 ohms	Go to Step 17	Go to Step 19
17	Measure the resistance between the BBEC terminal C4 and the BBEC relay cavity for the inadvertent power relay circuit 1393. Is the resistance at or below the specified value?	2 ohms	Go to Step 18	Go to Step 20
18	1. Check for a loose or a poor connection at the BBEC harness connector on terminal C4. 2. Repair as necessary. Was a repair Necessary?	—	Go to Step 25	Go to Step 20
19	Repair open in circuit 1393. Is the repair complete?	—	Go to Step 25	—
20	Replace the BBEC. Is repair complete?	—	Go to Step 25	—
21	Replace the inadvertent power Relay. Is repair complete?	—	Go to Step 25	—
22	Repair poor connection. Is the repair complete?	—	Go to Step 25	—
23	1. Check for a short to ground or an open on circuit 1732, including a short in any of the lamp request input circuits. 2. Repair as necessary. Was a repair necessary?	—	Go to Step 25	Go to Step 10
24	1. Re-connect all components and wiring. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. 5. Check for current DTC's. Is DTC B1480 set as a current code?	—	Go to Step 23	DTC B1480 is intermittent. Refer to *Diagnostic Aids.*
25	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2575 - Head Lamp Request/Feedback Mismatch



Hot At All Times
Power Distribution Section 8A-10
B8
A
HDLP SW Fuse 1 10 A
B
IP Fuse Block
C7
0.8 BLK
1050
0.35 ORN
1940
E
D
Headlamp Switch Assembly
PKLP
AUTO
HDLP
HDLP
AUTO
PKLP
H
C
0.35 WHT
352
E12
C203
P100
0.35 PPL/WHT
549
0.35 WHT
352
0.35 WHT
352
B8
C3
A11
C2
C5
C1
Truck Body Control Module
Headlamp Request
Headlamp Power Relay
TBC
C1=BRN
C2=BLU
C3=PPL
352
Headlamp Power Relay
1
2
Underhood Bussed Electrical Center (UBEC)
Ground Distribution 8a-14
350
F7
C2
2 BLK
350
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14

GG 262884

Circuit Description

The TBC monitors the voltage on circuit 352 to determine if the head lamp power relay was requested ON. When the voltage on circuit 352 is low and the head lamp request circuit (549) is pulled to ground the TBC will set a related DTC. The TBC uses circuit 352 to determine the actual state of the head lamp power relay circuit. The TBC also monitors the ignition switch position based on ignition signal inputs.

Conditions for Setting the DTC

- When there is a short to ground in circuit 352 and the head lamp relay was requested ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The head lamps will be ON in the AUTO position when the light sensor is in the LIGHT state.
- The head lamps will be ON in any position.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table.

2. This checks the HDLP SW fuse for the head lamps.
3. This checks the head lamp switch.
6. This checks circuit 352 for a short to ground.

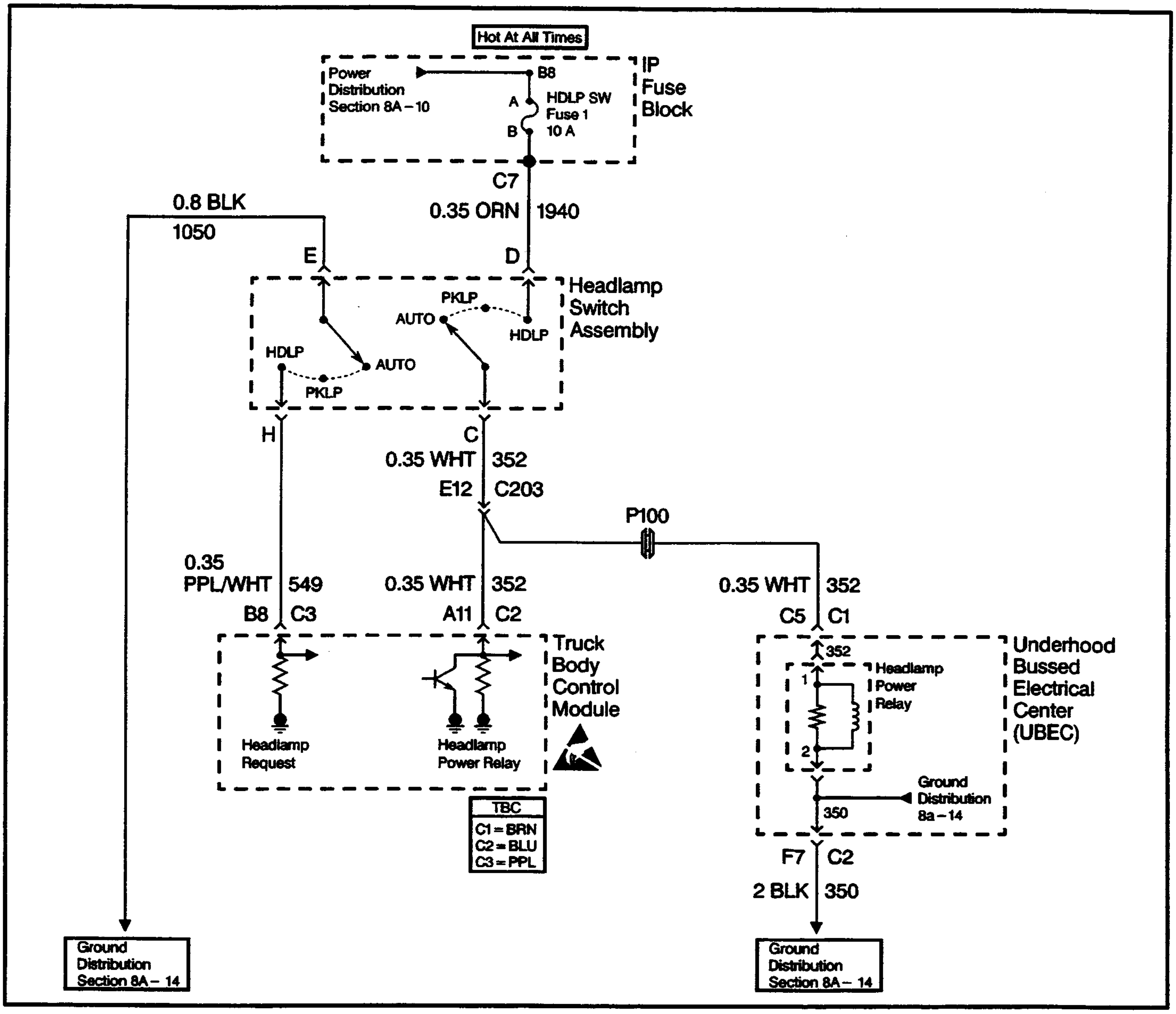
DTC B2575 - Head Lamp Request/Feedback Mismatch

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Check the HDLP SW fuse. 2. Replace if needed. Is the HDLP SW fuse replaced?	10 Amp Fuse #1	Go to Step 3	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Disconnect Light Blue TBC connector. 3. Turn ON head lamps at switch. Does 10A HDLP SW fuse blow?	—	Go to Step 4	Go to Step 8
4	1. Turn Head Lamp switch to the AUTO position when the vehicle is in the LIGHT State. 2. Remove HDLP PWR relay from UBEC. 3. Replace 10A HDLP SW fuse. 4. Turn ON head lamps. Does HDLP SW fuse blow?	—	Go to Step 5	Go to Step 11
5	1. Turn Head Lamp switch to the AUTO position when the vehicle is in the LIGHT State. 2. Disconnect 48-way connector at steering column. 3. Measure resistance between Light Blue TBC connector terminal A11 (circuit 352) and ground. Does meter display OL (Infinite)?	—	Go to Step 12	Go to Step 6
6	1. Disconnect connector C1 from UBEC. 2. Measure resistance between Light Blue TBC connector terminal A11 and ground. Does meter display OL (Infinite)?	—	Go to Step 7	Go to Step 14
7	Replace the UBEC for the short to ground condition on circuit 352 for the HDLP PWR relay. Is the repair complete?	—	Go to Step 15	—

DTC B2575 - Head Lamp Request/Feedback Mismatch (continued)

Step	Action	Value(s)	Yes	No
8	1. Turn Head Lamp switch to the AUTO position when the vehicle is in the LIGHT State. 2. Remove HDLP PWR relay from UBEC. 3. Measure resistance between Light Blue TBC connector terminal A11 and ground. Does meter display OL (Infinite)?	—	Go to Step 9	Go to Step 5
9	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B2575 set as a current code?	—	Go to Step 10	DTC B2575 is intermittent. Refer to *Diagnostic Aids*.
10	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 15	—
11	Replace HDLP PWR relay. Is the repair complete?	—	Go to Step 15	—
12	1. Disconnect connector from the head lamp switch Assembly. 2. Check for a short to ground in circuit 352 from the 48 way connector E12 to the head lamp switch Assembly. 3. Repair as necessary. Was a repair necessary?	—	Go to Step 15	Go to Step 13
13	Replace head lamp switch Assembly in steering column. Is the repair complete?	—	Go to Step 15	—
14	Repair short to ground in circuit 352 between Light Blue TBC connector terminal A11 and 48-way steering column connector E12 or between UBEC connector C1 on terminal C5 and 48-way steering column connector E12. Is the repair complete?	—	Go to Step 15	—
15	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2577 - Head Lamp Control Circuit Low


Hot At All Times
Power Distribution Section 8A-10
B8
A
B
HDLP SW Fuse 1 10 A
IP Fuse Block
C7
0.35 ORN
1940
0.8 BLK
1050
E
D
PKLP
AUTO
HDLP
HDLP
AUTO
PKLP
Headlamp Switch Assembly
H
C
0.35 WHT
352
E12
C203
P100
0.35 PPL/WHT
549
B8
C3
0.35 WHT
352
A11
C2
0.35 WHT
352
C5
C1
Headlamp Request
Headlamp Power Relay
Truck Body Control Module
TBC
C1 = BRN
C2 = BLU
C3 = PPL
352
1
2
Headlamp Power Relay
Ground Distribution 8a-14
350
Underhood Bussed Electrical Center (UBEC)
F7
C2
2 BLK
350
Ground Distribution Section 8A-14
Ground Distribution Section 8A-14

GG 262884

Circuit Description

The TBC monitors the voltage on circuit 352 to determine if the head lamp power relay was requested ON by the TBC. When the TBC does not sense battery voltage on circuit 352 and the TBC is requesting the head lamp relay ON the TBC will set a related DTC. The TBC also uses circuit 352 to determine the actual state of the head lamp power relay circuit. When the TBC turns ON the head lamps or the DRL's the head lamp power relay should be ON. The TBC also monitors the ignition switch position based on ignition signal inputs.

Conditions for Setting the DTC

- The head lamps in the AUTO position.
- When there is a short to ground in circuit 352.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The head lamps and the DRL's will not be ON with the head lamp switch in the AUTO position.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- The HDLP fuse will blow if the head lamps are turned ON using the head lamp switch and circuit 352 is shorted to ground.
- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table.

3. This checks the fuse for the head lamp switch.
4. This checks the head lamp power relay.
5. This checks the circuit 352 for a short to ground.

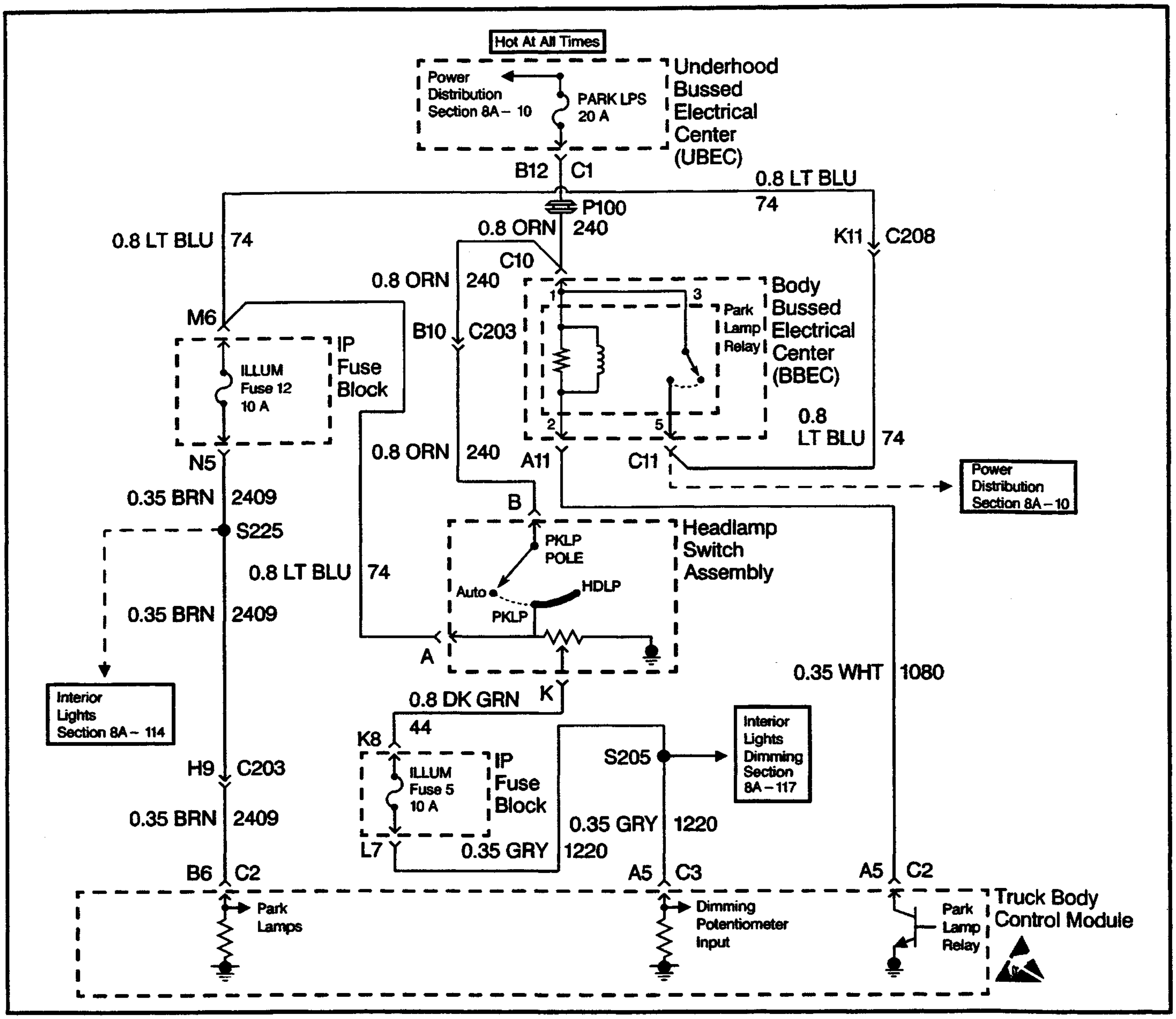
DTC B2577 - Head Lamp Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Check the HDLP SW fuse. 2. Replace if needed. Is the HDLP SW fuse replaced?	10 Amp Fuse #1	Go to Step 3	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Disconnect Light Blue TBC connector. 3. Turn the head lamp switch to the HEAD LAMP position. Does 10A HDLP SW fuse blow?	—	Go to Step 4	Go to Step 8
4	1. Turn the head lamp switch to the AUTO position. 2. Remove head lamp power relay from UBEC. 3. Replace 10A HDLP SW fuse. 4. Turn ON head lamps. Does HDLP SW fuse blow?	—	Go to Step 5	Go to Step 7
5	1. Turn the head lamp switch to the AUTO position. 2. Disconnect 48-way connector at steering column. 3. Measure resistance between Light Blue TBC connector terminal A11 and ground. Does meter display OL (Infinite)?	—	Go to Step 11	Go to Step 6
6	1. Disconnect connector C1 from UBEC. 2. Measure resistance between Light Blue TBC connector terminal A11 and ground. Does meter display OL (Infinite)?	—	Go to Step 11	Go to Step 13
7	Replace the head lamp power relay. Is the repair complete?	—	Go to Step 14	—

DTC B2577 - Head Lamp Control Circuit Low (continued)

Step	Action	Value(s)	Yes	No
8	1. Turn the head lamp switch to the AUTO position. 2. Remove head lamp relay from UBEC. 3. Measure resistance between Light Blue TBC connector terminal A11 and ground. Does meter display OL (Infinite)?	—	Go to Step 9	Go to Step 5
9	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B2577 set as a current code?	—	Go to Step 10	DTC B2577 is intermittent. Refer to *Diagnostic Aids.*
10	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 14	—
11	1. Disconnect connector at the head lamp switch for circuit 352. 2. Check for a short to ground in circuit 352 from the 48 way connector terminal E12 and the head lamp switch terminal C. 3. Repair as necessary. Was a repair necessary?	—	Go to Step 14	Go to Step 12
12	Replace the head lamp switch assembly. Is the repair complete?	—	Go to Step 14	—
13	Repair short to ground in circuit 352 between Light Blue TBC connector terminal A11 and 48-way steering column connector terminal E12 or between the UBEC connector C1 terminal C5 and the 48-way steering column connector terminal E12. Is the repair complete?	—	Go to Step 14	—
14	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2585 - Park Lamp Control Circuit Malfunction



Hot At All Times
Power Distribution Section 8A-10
PARK LPS 20 A
Underhood Bussed Electrical Center (UBEC)
B12 C1
P100
0.8 LT BLU 74
0.8 ORN 240
C10
K11 C208
Body Bussed Electrical Center (BBEC)
Park Lamp Relay
1 2 3 5
M6
B10 C203
IP Fuse Block
ILLUM Fuse 12 10 A
0.8 LT BLU 74
N5
A11 C11
Power Distribution Section 8A-10
0.35 BRN 2409
S225
B
Headlamp Switch Assembly
PKLP POLE
Auto
HDLP
PKLP
A
0.35 WHT 1080
Interior Lights Section 8A-114
K
0.8 DK GRN 44
K8
ILLUM Fuse 5 10 A
IP Fuse Block
L7
S205
Interior Lights Dimming Section 8A-117
0.35 GRY 1220
H9 C203
B6 C2
A5 C3
A5 C2
Park Lamps
Dimming Potentiometer Input
Park Lamp Relay
Truck Body Control Module
5308w3282

Circuit Description

The TBC monitors the voltage on circuit 2409 to determine the actual state of the Park Lamp Relay The TBC also uses circuit 1080 to turn ON the Park Lamp Relay. When the voltage on circuit 1080 is low and the voltage on circuit 2409 is low the TBC will set a related DTC.

Conditions for Setting the DTC

- When the voltage on circuit 2409 is low or circuit 2409 is open and the TBC is requesting the Park Lamps ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The Park Lamps will be disabled.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- Use an incandescent shop light or flash light and direct the lighting toward the light sensor to force the light sensor into a LIGHT state.
- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table.

2. Checks if the light sensor will turn the head light ON.
3. This checks the park lamp fuse.
5. Checks for an open in circuit 1080.
6. This checks the park lamp relay.
17. Checks for a short to ground in circuit 2409.

DTC B2585 - Park Lamp Control Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Head lamp switch in the AUTO position. 2. Using the scan tool make sure the vehicle is in the LIGHT state when performing this table. 3. Parking brake not engaged. 4. Cover light sensor with dark tape. 5. Turn the ignition switch to the RUN position. Do the IPC back lights come ON?	—	Go to Step 12	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Check 20 amp PARK LP fuse in the UBEC. Is the fuse OK?	20 Amp	Go to Step 4	Go to Step 13
4	Check 10 amp ILLUM fuse in the I/P fuse block. Is the fuse OK?	10 Amp ILLUM #12	Go to Step 5	Go to Step 17
5	1. Disconnect Light Blue TBC connector. 2. Remove park lamp relay from the BBEC. 3. Measure the resistance between the BBEC cavity for the park lamp relay circuit 1080 and the Light Blue TBC connector terminal A5. Is the resistance at or less than the specified value?	5 ohms	Go to Step 6	Go to Step 21
6	Measure the resistance between the park lamp relay terminals 1 and 2. Is the resistance at or less than the specified value?	95 ohms	Go to Step 7	Go to Step 22
7	1. Remove 10A ILLUM fuse in the I/P fuse block 2. Measure the resistance between the BBEC cavity for the park lamp relay circuit 74 and the ILLUM fuse at the I/P Fuse Block terminal M6. Is the resistance at or less than the specified value?	5 ohms	Go to Step 8	Go to Step 23

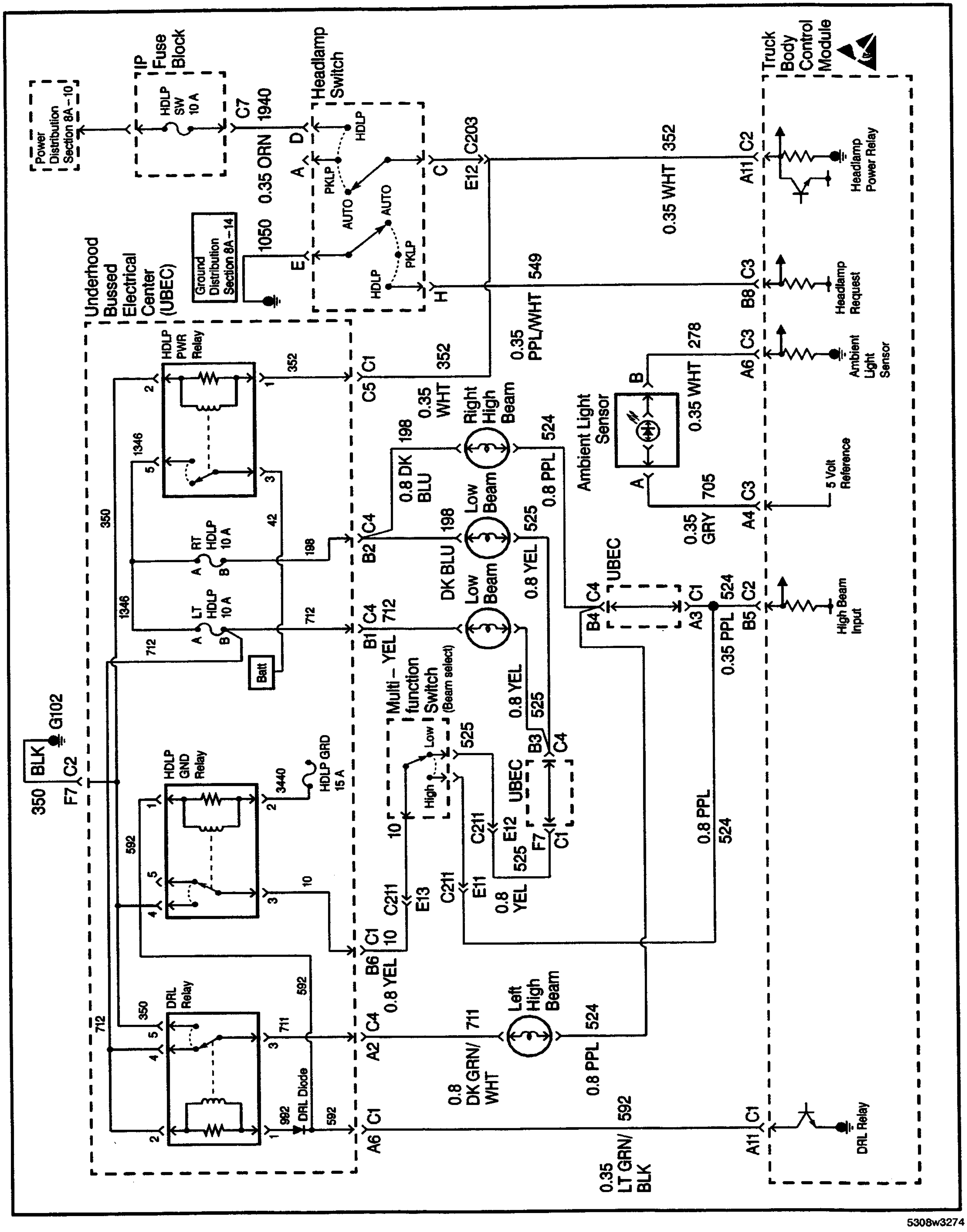
DTC B2585 - Park Lamp Control Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
8	1. Use a fused jumper wire to energize the park lamp relay. 2. Connect terminal 2 of the relay to battery voltage. 3. Connect terminal 1 of the relay to ground. 4. Measure resistance between relay terminals 3 and 5. Is the resistance at or less than the specified value?	95 ohms	Go to Step 9	Go to Step 22
9	1. Light Blue TBC connector disconnected. 2. Measure resistance between the ILLUM fuse terminal B and the Light Blue TBC connector terminal B6. Is the resistance at or less than the specified value?	5 ohms	Go to Step 10	Go to Step 25
10	1. Install the ILLUM fuse in the I/P fuse block. 2. Re-connect all components. 3. Clear DTC(s). 4. Turn the ignition switch to the OFF position for 10 seconds. 5. Turn the ignition switch to the RUN position. Is DTC B2585 set as a current code?	10 Amp Fuse #12	Go to Step 11	DTC B2585 is intermittent. Refer to *Diagnostic Aids.*
11	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 26	—
12	Turn the ignition switch to the OFF position. Is the action complete?	—	Go to Step 5	—
13	1. Replace PARK LP fuse in the UBEC. 2. Turn the ignition switch to the RUN position. Does the fuse blow?	20 Amp	Go to Step 16	Go to Step 14
14	1. Clear DTC(s). 2. Turn the ignition switch to the OFF position for 10 seconds. 3. Turn the ignition switch to the RUN position. Is DTC B2585 set as a current code?	—	Go to Step 15	Go to Step 26
15	Remove dark tape from light sensor. Is the action complete?	—	Go to Step 4	—
16	Repair short to ground in circuit 240. Refer to *Power Distribution Section 8A-10* for schematics. Is the repair complete?	—	Go to Step 26	—
17	1. Replace the ILLUM fuse in the I/P fuse block. 2. Remove dark tape from light sensor. 3. Turn the ignition switch to the RUN position. Does fuse blow?	10 Amp Fuse #12	Go to Step 19	Go to Step 18

DTC B2585 - Park Lamp Control Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
18	Cover light sensor again with dark tape. Does fuse blow?	—	Go to step 20	Go to Step 26
19	Repair short to ground in circuit 2409. Refer to *Power Distribution Section 8A-10* for schematics. Is the repair complete?	—	Go to Step 26	—
20	Repair short to ground in circuit 74. Refer to *Power Distribution Section 8A-10* for schematics. Is the repair complete?	—	Go to Step 26	—
21	1. Check for an open in circuit 1080. 2. Repair as necessary. Was a repair necessary?	—	Go to Step 26	Go to Step 24
22	Replace the park lamp relay. Is the repair complete?	—	Go to Step 26	—
23	Repair open in circuit 74. Is the repair complete?	—	Go to Step 26	—
24	Replace the BBEC. Is the repair complete?	—	Go to Step 26	—
25	Repair open in circuit 2409. Is the repair complete?	—	Go to Step 26	—
26	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2600 - Daytime Running Lamps Circuit Malfunction


Power Distribution Section 8A-10
IP Fuse Block
HDLP SW 10 A
C7
1940
0.35 ORN
Headlamp Switch
HDLP
PKLP
AUTO
D
A
C
E
H
1050
Ground Distribution Section 8A-14
C203
E12
352
0.35 WHT
549
0.35 PPL/WHT
Truck Body Control Module
C2
A11
Headlamp Power Relay
C3
B8
Headlamp Request
278
A6
Ambient Light Sensor
B
A
705
0.35 GRY
A4
5 Volt Reference
524
C2
B5
0.35 PPL
High Beam Input
Underhood Bussed Electrical Center (UBEC)
HDLP PWR Relay
1346
42
C5
C1
198
0.35 WHT
0.8 DK BLU
Right High Beam
0.8 PPL
Low Beam
525
0.8 YEL
C4
B2
DK BLU
RT HDLP 10 A
LT HDLP 10 A
712
B1
YEL
Batt
UBEC
B4
A3
C1
350
BLK
G102
F7
C2
HDLP GND Relay
3440
HDLP GRD 15 A
592
10
Multi-function Switch (Beam select)
Low
High
C211
E12
E13
E11
F7
B3
B6
0.8 YEL
DRL Relay
711
A2
0.8 DK GRN/WHT
Left High Beam
DRL Diode
A6
0.35 LT GRN/BLK
DRL Relay
A11
1
2
3
4
5

5308w3274

Circuit Description

The TBC monitors the voltage on circuit 524 to determine the amount of voltage present in the High Beam circuit. When circuit 524 is shorted to battery voltage or when circuit 524 is shorted to ground and the Daytime Running Lamps (DRL) are requested ON, the TBC will set a DTC B2600. The TBC monitors circuit 524 to determine if the Daytime Running Lamps are ON or if the High Beams are ON.

Conditions for Setting the DTC

- When circuit 524 is open or when circuit 524 is shorted to battery voltage or when circuit 524 is shorted to ground and the TBC commands the DRL relay ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The Daytime Running Lamps will not function properly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- The scan tool can command the DRL relay ON. This test is located under the Special Functions Menu.
- Using the Scan Tool, compare the state of the DRL relay the actual state of the DRL relay.
- Check for an inoperative High Beam Head Lamp.
- Use an incandescent shop light or flash light and direct the lighting toward the light sensor to force the light sensor into a LIGHT state.
- Perform a visual check of the wiring and connectors
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table.

4. Checks circuit 524 for a short to ground.
5. Checks circuit 524 for a short to battery voltage.
6. This checks the power feed circuit for the HDLP PWR relay.
7. This checks the HDLP PWR relay.
8. This checks the power feed circuit to the HDLP fuses.
10. This checks the DRL relay.
12. This checks circuit 524 for an open or a short to voltage.
22. This checks the DRL Diode.

DTC B2600 - Daytime Running Lamps Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	Use a scan tool and check for current DTC(s). Is DTC B2647 OR DTC B2648 set as a current code?	—	Go to DTC B2647/ B2648 Table	Go to Step 3
3	Is DTC B2577 set as a current code?	—	Go to DTC B2577 Table	Go to Step 4
4	1. Use the scan tool to make sure the vehicle is in the LIGHT state. 2. Turn the ignition switch to the RUN position. 3. Head Lamp switch in the AUTO position. 4. Beam selector switch in the LOW beam position. 5. Using a DMM, measure the voltage from the TBC connector C2 terminal B5 to ground. Does DMM display voltage less than 25 percent of battery voltage?	Less than 25 percent of Battery Voltage	Go to Step 6	Go to Step 5
5	1. Use the scan tool to make sure the vehicle is in the LIGHT state. 2. Turn the ignition switch to the RUN position. 3. Head Lamp switch in the AUTO position. 4. Beam selector switch still in the LOW beam position. 5. Using a DMM, measure the voltage from the TBC connector C2 terminal B5 to ground. Does DMM display voltage more than 75 percent of battery voltage?	More than 75 percent of Battery Voltage	Go to Step 17	Go to Step 18
6	1. Turn the ignition switch to the OFF position. 2. Remove the HDLP PWR relay. 3. Use the scan tool to make sure the vehicle is in the LIGHT state. 4. Head Lamp switch in the HEAD LAMP position. 5. Turn the ignition switch to the RUN position. 6. Beam selector switch still in the LOW beam position. 7. Check for an open circuit to the UBEC for the HDLP PWR relay feed circuit (circuits 42 and 352). Was an open found to the UBEC for the HDLP PWR Relay feed circuits?	Battery Voltage	Go to Step 14	Go to Step 7
7	1. HDLP PWR relay still removed. 2. Use a fused jumper wire to energize the HDLP PWR relay. 3. Connect terminal 1 of the HDLP PWR relay to battery voltage. 4. Connect terminal 2 of the HDLP PWR relay to ground. 5. Measure between the HDLP PWR relay terminals 3 and 5 with a DMM. Does the DMM display indicate that the HDLP PWR relay contacts are closing?	—	Go to Step 8	Go to Step 24

DTC B2600 - Daytime Running Lamps Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition switch to the OFF position. 2. Install the HDLP PWR relay. 3. Use the scan tool to make sure the vehicle is in the LIGHT state. 4. Head Lamp switch in the HEAD LAMP position. 5. Turn the ignition switch to the RUN position. 6. Beam selector switch still in the LOW beam position. 7. Remove both Head Lamp fuses. 8. Using a DMM, measure the supply voltage from the LT HDLP fuse in the UBEC to ground. 9. Using a DMM, measure the supply voltage from the RT HDLP fuse in the UBEC to ground. Does DMM display battery voltage on both circuits?	Battery Voltage	Go to Step 9	Go to Step 16
9	1. Turn the ignition switch to the OFF position. 2. Re-connect all components and wiring. 3. Use the scan tool to make sure the vehicle is in the LIGHT state. 4. Disconnect the DRL Relay. 5. Turn the ignition switch to the RUN position. 6. Head Lamp switch in the HEAD LAMP position. 7. Beam selector switch still in the LOW beam position. 8. Using a DMM, measure the voltage from the UBEC cavity for the DRL relay circuit(s) 712 to ground. Does DMM display battery voltage on both circuits?	Battery Voltage	Go to Step 10	Go to Step 16
10	1. The DRL relay still removed. 2. Use a fused jumper wire to energize the DRL relay. 3. Connect terminal 1 of the DRL relay to battery voltage. 4. Connect terminal 2 of the DRL relay to ground. 5. Measure between the DRL relay terminals 3 and 5 with a DMM. Does the DMM display indicate that the relay contacts are closing?	—	Go to Step 20	Go to Step 25
11	1. Make sure the circuit(s) for the LT HDLP fuse and the RT HDLP fuse is not shorted to ground (repair as necessary) and replace the LT HDLP fuse / RT HDLP fuse in the UBEC. 2. Repair as necessary. Was a repair necessary?	10 Amp 10 Amp	Go to Step 28	Go to Step 12

DTC B2600 - Daytime Running Lamps Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
12	1. Re-connect all components and wiring. 2. Head Lamp switch in the AUTO position. 3. Use the scan tool to make sure the vehicle is in the LIGHT state. 4. Turn the ignition switch from the OFF position to the RUN position. 5. Beam selector switch still in the LOW beam position. 6. Using a DMM, check circuit 524 for an open or a short to voltage from the UBEC connector C4 terminal B4 to both high beam lamps (including an open High Beam Lamp). 7. Repair as necessary. Was a repair necessary?	Less than 25 percent of Battery Voltage	Go to Step 28	Go to Step 13
13	1. Head Lamp switch in the AUTO position. 2. Use the scan tool to make sure the vehicle is in the LIGHT state. 3. Turn the ignition switch from the OFF position to the RUN position. 4. Beam selector switch still in the LOW beam position. 5. Using a DMM, check circuit 524 for an open or a short to voltage from the UBEC connector C1 Terminal to the Splice. 6. Using a DMM, check circuit 524 for an open or a short to voltage from the splice to connector C211 Terminal E11, including the High / Low Beam switch. 7. Using a DMM, check circuit 524 for an open or a short to voltage from the splice to the TBC connector C2 Terminal B5. 8. Repair as necessary. Was a repair necessary?	—	Go to Step 28	Go to Step 19
14	Repair the open circuit(s) to the UBEC for the HDLP PWR relay feed circuit(s) 42 and 352, including the Head LAMP Switch. Is the repair complete?	—	Go to Step 28	—
15	Repair the open or the short to voltage in circuit 524. Is the repair complete?	—	Go to Step 28	—
16	Replace the UBEC. Is the repair complete?	—	Go to Step 28	—
17	Repair the short to voltage on circuit 524. Is the repair complete?	—	Go to Step 28	—

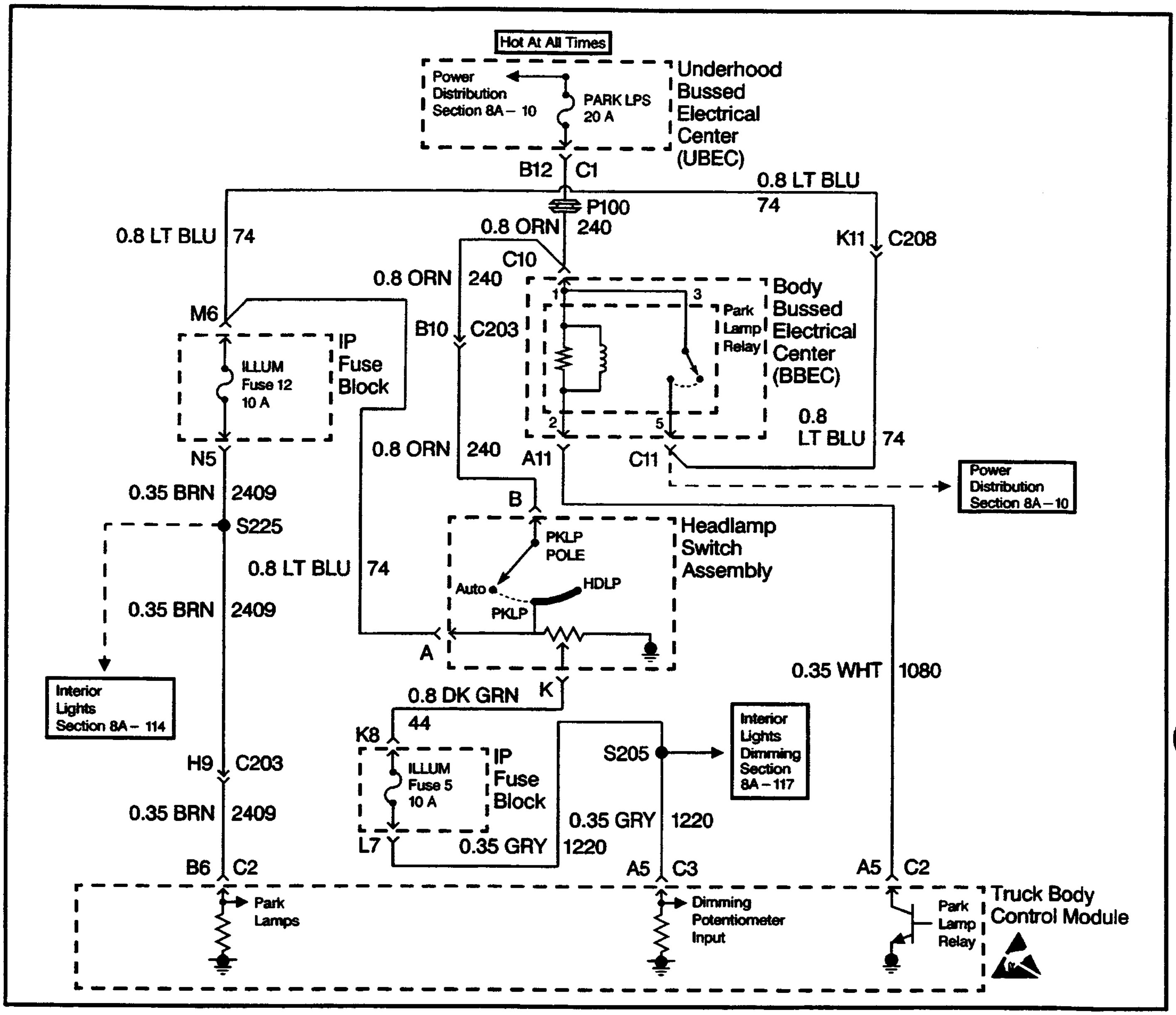
DTC B2600 - Daytime Running Lamps Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
18	1. Use the scan tool to make sure the vehicle is in the LIGHT state. 2. Turn the ignition switch to the OFF position. 3. Disconnect the TBC connector C2. 4. Remove circuit 524 from the TBC connector C2. 5. Re-connect the TBC connector C2. 6. Using a DMM, measure the voltage from the TBC harness 0n circuit 524 to ground. Does DMM display voltage between 25 percent and 75 percent of battery voltage?	—	Go to Step 19	Go to Step 17
19	1. Re-connect all components and wiring. 2. Replace the TBC. 3. Program the TBC with the proper calibrations. Is the repair complete?	—	Go to Step 28	—
20	1. The DRL relay still removed. 2. Remove the DRL Diode. 3. Using a DMM, measure between the UBEC cavities for the DRL relay circuit 992 and the DRL Diode cavity 992. Does the DMM display indicate continuity in the UBEC?	—	Go to Step 21	Go to Step 16
21	1. The DRL Diode still removed. 2. Remove the HDLP GND relay. 3. Use a DMM, measure between the UBEC cavities for the DRL Diode circuit 592 and the HDLP GND relay circuit 592. Does the DMM display indicate continuity in the UBEC?	—	Go to Step 22	Go to Step 16
22	1. DRL Diode still removed. 2. Use a DMM, measure between the DRL Diode Terminals. Does the DMM display indicate a good DRL Diode?	—	Go to Step 23	Go to Step 26
23	1. DRL Diode still removed. 2. Disconnect the TBC connector C1. 3. Use a DMM, measure between the UBEC cavity for the DRL Diode circuit 592 and the TBC connector C1 Terminal A11. Does the DMM display indicate a short to ground on circuit 592?	—	Go to Step 27	Go to Step 11

DTC B2600 - Daytime Running Lamps Circuit Malfunction (continued)

Step	Action	Value(s)	Yes	No
24	Replace the HDLP PWR Relay. Is the repair complete?	—	Go to Step 28	—
25	Replace the DRL Relay. Is the repair complete?	—	Go to Step 28	—
26	Replace the DRL Diode. Is the repair complete?	—	Go to Step 28	—
27	Repair the short to ground on circuit 592. Is the repair complete?	—	Go to Step 28	—
28	1. Re-connect all components and wiring. 2. Clear DTC(s). Is the action complete?	—	Go to *TBC System Check*	—

DTC B2613 - Dim Potentiometer Circuit High



Hot At All Times
Power Distribution Section 8A-10
PARK LPS 20 A
Underhood Bussed Electrical Center (UBEC)
B12 C1
0.8 LT BLU 74
P100
0.8 ORN 240
K11 C208
C10
0.8 ORN 240
M6
IP Fuse Block
ILLUM Fuse 12 10 A
N5
B10 C203
Park Lamp Relay
Body Bussed Electrical Center (BBEC)
0.8 LT BLU 74
A11
C11
Power Distribution Section 8A-10
0.35 BRN 2409
S225
B
PKLP POLE
Auto
HDLP
PKLP
Headlamp Switch Assembly
A
Interior Lights Section 8A-114
0.35 WHT 1080
0.8 DK GRN
K
K8 44
ILLUM Fuse 5 10 A
S205
Interior Lights Dimming Section 8A-117
H9 C203
0.35 GRY 1220
L7
B6 C2
A5 C3
A5 C2
Park Lamps
Dimming Potentiometer Input
Park Lamp Relay
Truck Body Control Module
5308w3282

Circuit Description

The TBC monitors the voltage on circuit 1220. When the voltage on circuit 1220 is shorted to battery the TBC will set a related DTC. The thumb wheel (Dome Lamp) switch sends a voltage to the TBC on circuit 1220 to indicate the position of the thumb wheel. The thumb wheel also provides dimming for the back lights, the Instrument Panel Cluster, the radio and the Overhead Console.

Conditions for Setting the DTC

- When the voltage on circuit 1220 is shorted to battery voltage and the Park Lamps are not ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The thumb wheel will not dim the instrument panel.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.

- Use an incandescent shop light or flash light and direct the lighting toward the light sensor to force the light sensor into a LIGHT state.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

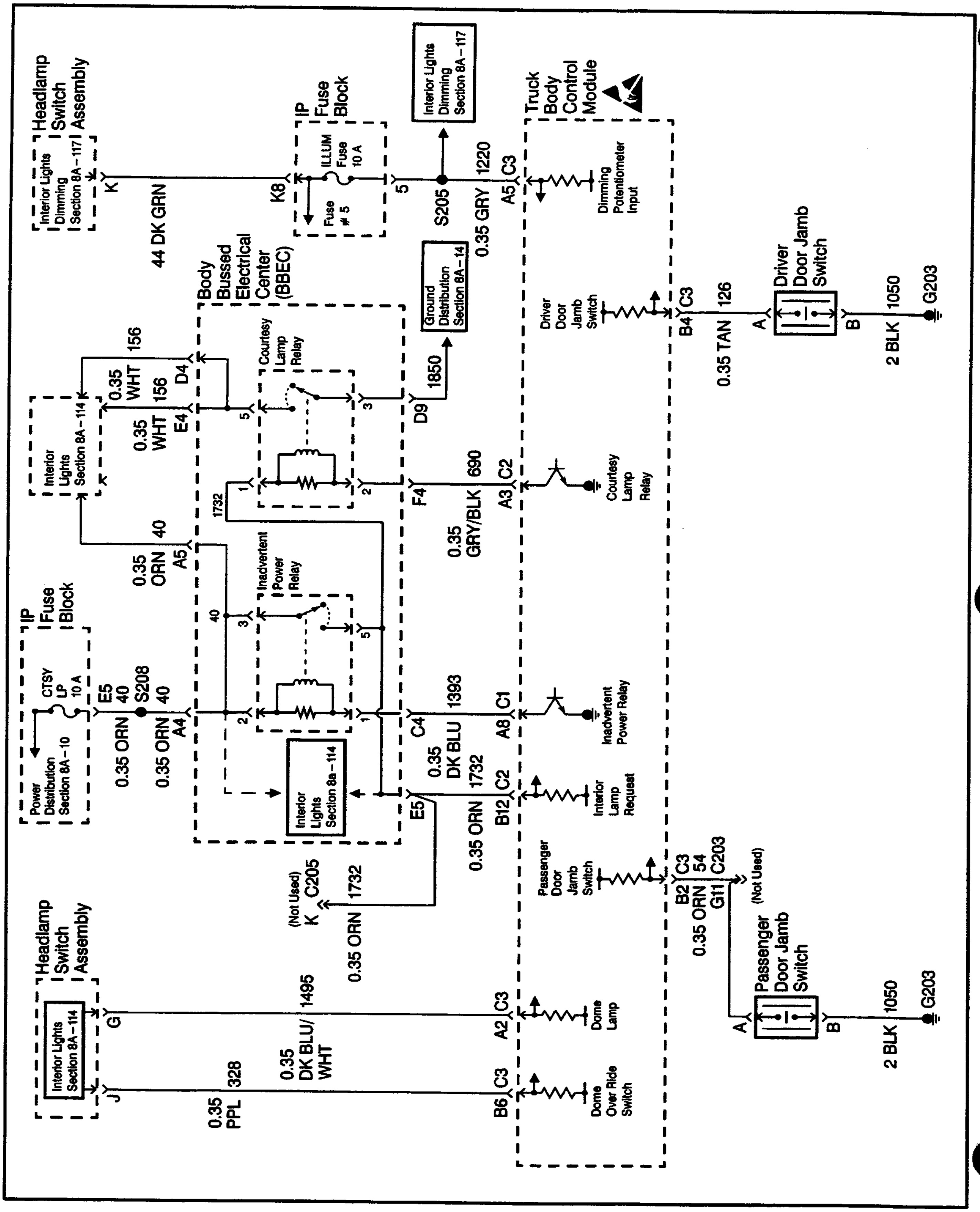
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

3. This checks the Head Lamp switch assembly.
4. This step checks for a short to battery voltage on circuit 1220.

DTC B2613 - Dim Potentiometer Circuit High

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Using the scan tool make sure the vehicle is in the light state. 2. Parking brake not applied. 3. Turn the ignition switch from the OFF position to the RUN position. 4. Clear DTC(s). 5. Cover light sensor with dark tape (Head Lamps / Park Lamp will come ON). Is B2585 set as a current code?	—	Go to Step 6	Go to Step 3
3	1. Turn the ignition switch to the OFF position. 2. Apply parking brake (Park Lamp will be OFF). 3. Head Lamps/ Park Lamp switch in the AUTO position. 4. Remove 10 amp ILLUM fuse. 5. Turn the ignition switch to the RUN position. Is B2613 set as a current code?	ILLUM Fuse #5 10 AMP	Go to Step 4	Go to Step 7
4	1. Turn the ignition switch to the OFF position. 2. Disconnect Purple TBC connector. 3. Turn the ignition switch to the RUN position. 4. Check circuit 1220 for a short to battery voltage with a DMM. Is circuit 1220 shorted to battery voltage?	—	Go to Step 5	Go to Step 8
5	Repair short to battery voltage in circuit 1220 Refer to *8A-117* for Devices on circuit 1220. Is the repair complete?	—	Go to Step 9	—
6	Perform DTC B2585 Table and then check if DTC B2613 is set as a current code. Is B2613 set as a current code after completing DTC B2585 Table?	—	Go to Step 2	Go to *TBC System Check*
7	Replace head lamp switch assembly. Is the repair complete?	—	Go to Step 9	—
8	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 9	—
9	Clear DTC(s) Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2617- Courtesy Lamp Circuit Low


Headlamp Switch Assembly
Interior Lights Dimming Section 8A-117
K
44 DK GRN
K8
IP Fuse Block
ILLUM Fuse 10 A
Fuse # 5
5
S205
Interior Lights Dimming Section 8A-117
0.35 GRY
1220
A5
C3
Truck Body Control Module
Dimming Potentiometer Input
Ground Distribution Section 8A-14
Body Bussed Electrical Center (BBEC)
Courtesy Lamp Relay
0.35 WHT
156
D4
0.35 WHT
156
E4
Interior Lights Section 8A-114
K
1850
D9
5
3
1
2
Driver Door Jamb Switch
B4
C3
0.35 TAN
126
A
Driver Door Jamb Switch
B
2 BLK
1050
G203
0.35 GRY/BLK
690
F4
A3
C2
Courtesy Lamp Relay
1732
0.35 ORN
40
A5
Inadvertent Power Relay
40
3
5
2
1
IP Fuse Block
CTSY LP 10 A
Power Distribution Section 8A-10
E5
40
S208
40
0.35 ORN
0.35 ORN
A4
0.35 DK BLU
1393
C4
A8
C1
Inadvertent Power Relay
0.35 ORN
1732
E5
B12
C2
Interior Lamp Request
Interior Lights Section 8a-114
(Not Used)
K
C205
1732
0.35 ORN
Passenger Door Jamb Switch
B2
C3
0.35 ORN
54
G11
C203
(Not Used)
Passenger Door Jamb Switch
A
B
2 BLK
1050
G203
Headlamp Switch Assembly
Interior Lights Section 8A-114
G
J
0.35 DK BLU/ WHT
1495
A2
C3
Dome Lamp
0.35 PPL
328
B6
C3
Dome Over Ride Switch

5308w3273

Circuit Description

The TBC monitors circuit 690 to determine when the courtesy lights are ON. When circuit 690 is shorted to ground and the interior lamp request is inactive (1732 High) the TBC will set DTC B2617.

Conditions for Setting the DTC

- When circuit 1732 is INACTIVE (1732 High).
- When circuit 690 is shorted to ground and TBC is commanding Courtesy Lamp Relay INACTIVE.
- The system voltage must be between 9.0 volts and 16.0 volts.
- All the above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The courtesy lights will not function properly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

2. This checks the courtesy lamp relay input to the TBC for being in the ACTIVE state.
3. This step checks for a short to ground on circuit 690.
4. This step checks for a short to ground in courtesy lamp relay.

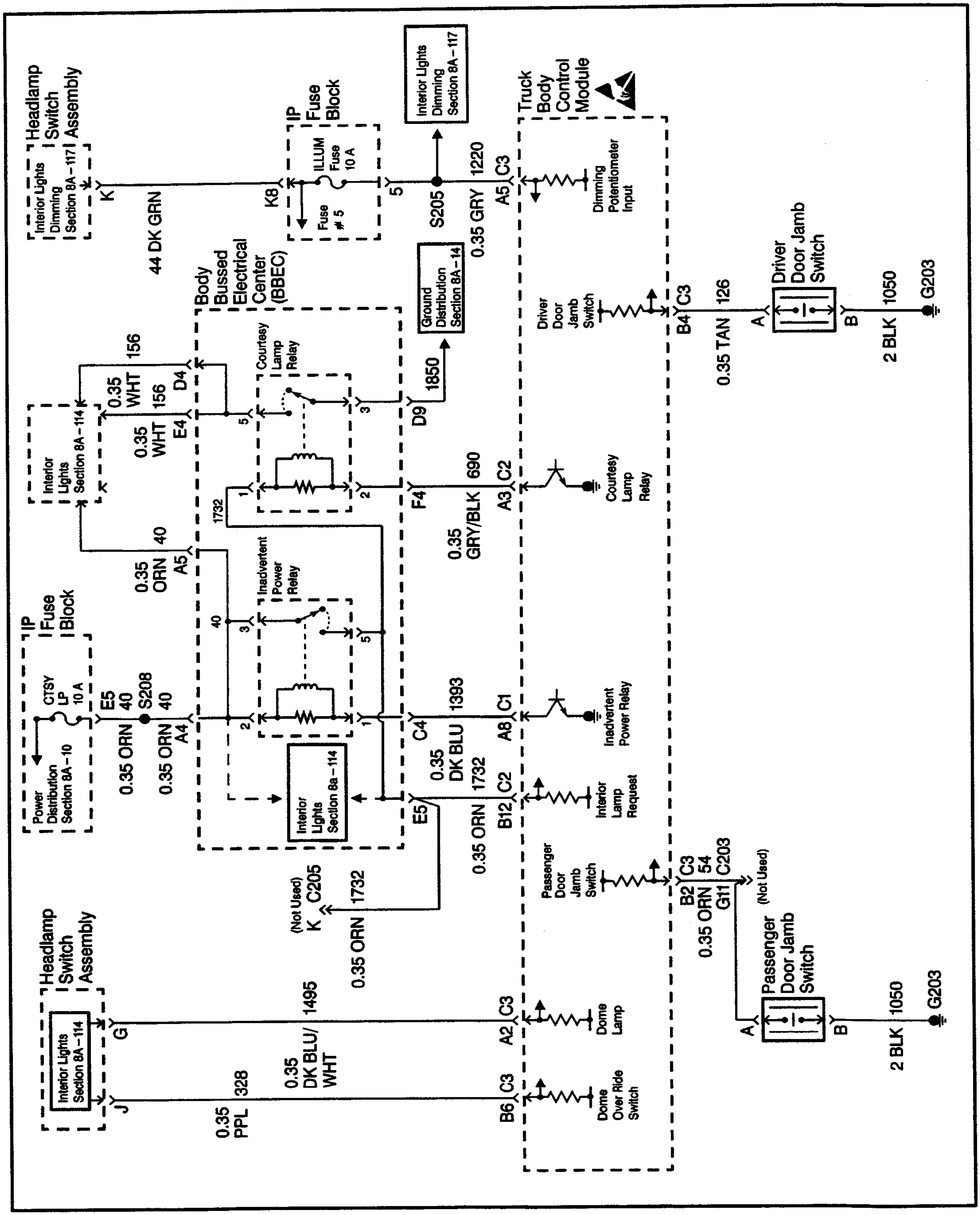
DTC B2617- Courtesy Lamp Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. DTC B2617 must be a current Code. 2. Ensure the dimming thumb wheel (dome lamp switch) is not in the full UP (dome/interior lights) position. 3. Ensure dome/interior lights override switch is ON. 4. Make sure the doors are closed for 45 seconds and remain closed for this step. 5. Connect a scan tool. 6. Monitor the courtesy lamp relay input on the scan tool. 7. Turn the ignition switch to the RUN position. Does the scan tool display the courtesy lamp relay input as ACTIVE?	—	Go to Step 3	DTC B2617 is intermittent. Refer to *Diagnostic Aids.*
3	1. Turn the ignition switch to the OFF position. 2. Remove the courtesy lamp relay from the BBEC. 3. Ensure doors have been closed for 45 seconds and remain closed for this step. 4. Disconnect Light Blue TBC connector. 5. Measure the resistance between the BBEC cavity for the courtesy lamp relay circuit 690 and the TBC connector for circuit 690 with a DMM. Does the DMM indicate a short to ground on circuit 690?	—	Go to Step 7	Go to Step 6

DTC B2617- Courtesy Lamp Circuit Low (continued)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to the OFF position. 2. Re-connect all components and wiring. 3. Turn the ignition switch to the RUN position. 4. Clear DTC(s). 5. Turn the ignition switch to the OFF position for 10 seconds. 6. Turn the ignition switch to the RUN position. 7. Turn the dimming thumb wheel all the way up to the ON (dome/interior lights) position (past the detent). Is B2617 set as a current code?	—	Go to Step 5	DTC B2617 is intermittent. Refer to *Diagnostic Aids.*
5	1. Re-connect all components and wiring. 2. Replace the TBC. 3. Program the TBC with the proper calibrations. Is the repair complete?	—	Go to Step 9	—
6	Measure the resistance between the courtesy lamp relay terminals 2 and 3. Is there continuity between the courtesy lamp relay terminals 2 and 3?	—	Go to Step 8	Go to Step 4
7	Repair the short to ground or open in circuit 690. Is the repair complete?	—	Go to Step 9	—
8	Replace the courtesy lamp relay. Is the repair complete?	—	Go to Step 9	
9	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2618 - Courtesy Lamp Circuit High


Headlamp Switch Assembly
Interior Lights Dimming Section 8A-117
K
44 DK GRN
K8
IP Fuse Block
ILLUM Fuse 10 A
Fuse # 5
5
S205
1220
0.35 GRY
C3
A5
Interior Lights Dimming Section 8A-117
Truck Body Control Module
Dimming Potentiometer Input
Body Bussed Electrical Center (BBEC)
Ground Distribution Section 8A-14
Interior Lights Section 8A-114
156
0.35 WHT
D4
E4
Courtesy Lamp Relay
3
5
1
2
D9
1850
Driver Door Jamb Switch
B4
C3
126
0.35 TAN
Driver Door Jamb Switch
A
B
1050
2 BLK
G203
1732
F4
690
C2
A3
0.35 GRY/BLK
Courtesy Lamp Relay
40
0.35 ORN
A5
Inadvertent Power Relay
IP Fuse Block
CTSY LP 10 A
Power Distribution Section 8A-10
E5
S208
A4
0.35 ORN
C4
1393
C1
A8
0.35 DK BLU
Inadvertent Power Relay
Interior Lights Section 8a-114
E5
1732
C2
B12
0.35 ORN
Interior Lamp Request
Passenger Door Jamb Switch
B2
C3
54
G11
C203
0.35 ORN
(Not Used)
(Not Used)
K
C205
1732
0.35 ORN
Passenger Door Jamb Switch
A
B
1050
2 BLK
G203
Headlamp Switch Assembly
Interior Lights Section 8A-114
G
1495
C3
A2
0.35 DK BLU/ WHT
Dome Lamp
J
328
0.35 PPL
C3
B6
Dome Over Ride Switch

5308w3273

Circuit Description

The TBC monitors circuit 690 to determine when the courtesy lights are ON. When circuit 690 is shorted to battery voltage the TBC will set a related DTC. The TBC also monitors the ignition switch position based on ignition signal inputs. The TBC performs a self test on power up.

Conditions for Setting the DTC

- When circuit 690 is shorted to battery voltage and the TBC commands the courtesy lamp relay ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The courtesy lights will not function properly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

2. This step checks for a short to battery voltage in circuit 690.
3. This step checks the courtesy lamp relay.
7. This step determines if circuit 690 is shorted to battery voltage.

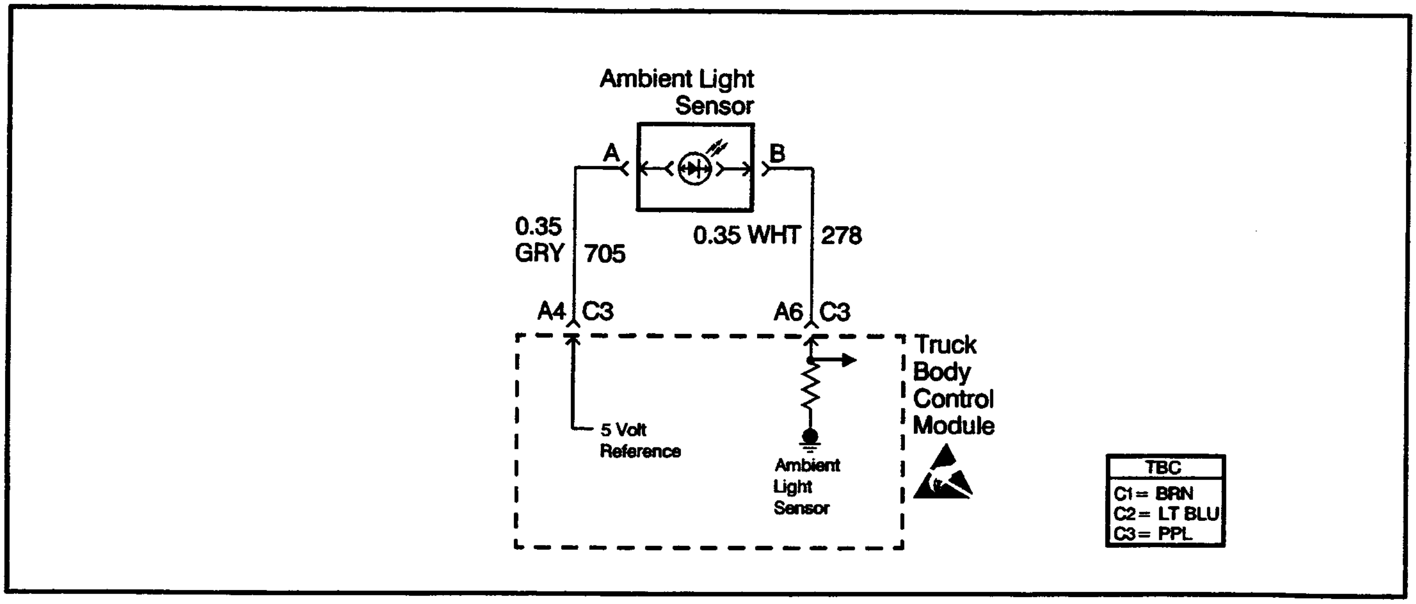
DTC B2618 - Courtesy Lamp Circuit High

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Turn the ignition switch to the OFF position. 2. Remove courtesy lamp relay from BBEC. 3. Turn the ignition switch to the RUN position. 4. Measure the voltage between the BBEC cavity for the courtesy lamp relay circuit 690 and ground. Is it approximately battery voltage?	—	Go to Step 7	Go to Step 3
3	Measure the resistance between the courtesy lamp relay terminals 1 and 5. Is there continuity between the courtesy lamp relay terminals 1 and 5?	—	Go to Step 11	Go to Step 4
4	Measure the resistance between the courtesy lamp relay terminals 1 and 2. Is the resistance at or less than the specified value?	95 ohms	Go to Step 5	Go to Step 11

DTC B2618 - Courtesy Lamp Circuit High (continued)

Step	Action	Value(s)	Yes	No
5	1. Re-connect all components and wiring. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. 5. Turn the dimming thumb wheel all the way up (past the detent) to the Interior lamp ON position, the courtesy lamp relay should turn ON. Is DTC B2618 set as a current code?	—	Go to Step 6	DTC B2618 is intermittent. Refer to *Diagnostic Aids.*
6	1. Turn the ignition switch to the OFF position. 2. Disconnect the Light Blue TBC connector. 3. Remove circuit 690 from the TBC Blue connector. 4. Connect the Light Blue TBC connector. 5. Turn the ignition switch to the RUN position. 6. Measure the voltage between the TBC connector on circuit 690 and ground. Is approximately battery voltage?	—	Go to Step 10	Go to Step 8
7	1. Turn the ignition switch to the OFF position. 2. Disconnect the Light Blue TBC connector. 3. Remove circuit 690 from the TBC Blue connector. 4. Connect the Light Blue TBC connector. 5. Turn the ignition switch to the RUN position. 6. Measure the voltage between the TBC connector on circuit 690 and ground. Is approximately battery voltage?	—	Go to Step 10	Go to Step 8
8	1. Re-connect all components and wiring. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for 10 seconds. 4. Turn the ignition switch to the RUN position. Is DTC B2618 set as a current code?	—	Go to Step 9	DTC B2618 is intermittent. Refer to *Diagnostic Aids.*
9	1. Replace the TBC. 2. Program the TBC with the proper calibrations. Is the repair complete?	—	Go to Step 12	—
10	Repair the short to battery voltage in circuit 690. Is the repair complete?	—	Go to Step 12	—
11	Replace the courtesy lamp relay. Is the repair complete?	—	Go to Step 12	
12	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2647 - Ambient Light Sensor Circuit Low



GG 260630

Circuit Description

The TBC monitors circuit 278 to determine when the headlights lights need to be turned ON when the head lamps are in the AUTO mode. When circuit 278 to the TBC is low the TBC will set a related DTC.

Conditions for Setting the DTC

- When circuit 278 is shorted to ground or circuit 278 is open or circuit 705 is open.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The automatic headlight control will be turned ON.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

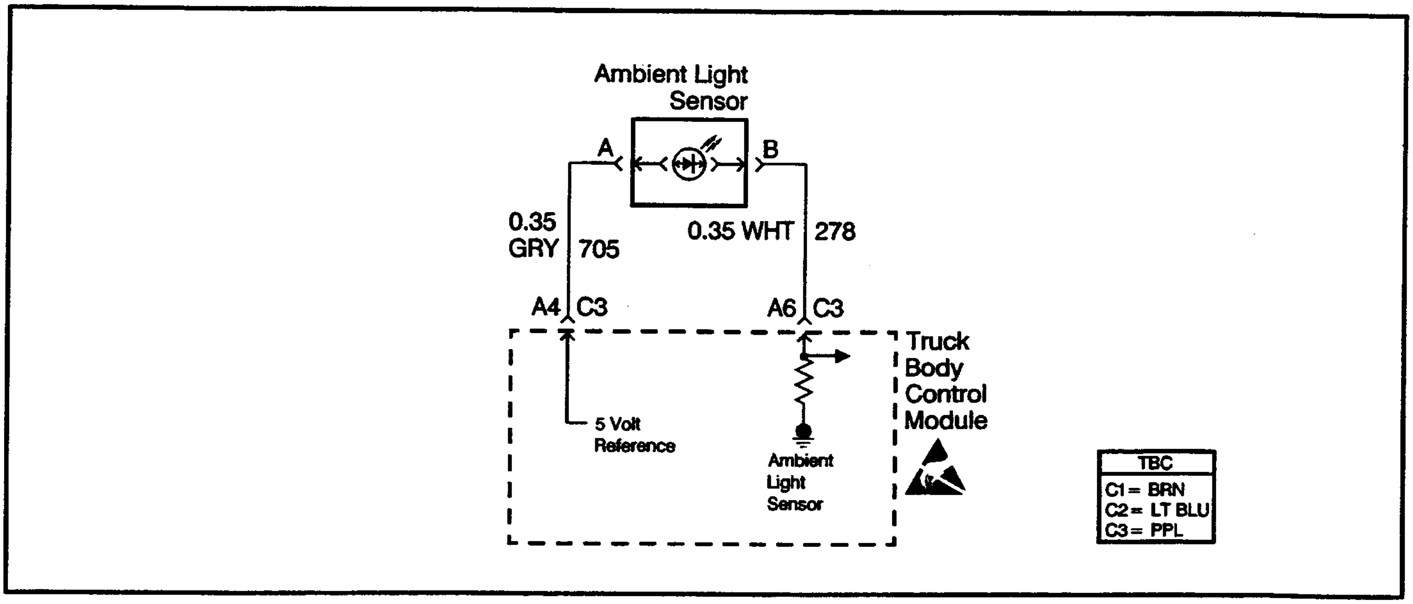
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

4. This step checks the light sensor circuit for a short to ground.
5. This step checks the light sensor circuit for an open.

DTC B2647 - Ambient Light Sensor Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	Install a scan tool. Is B1397 set as a current code?	—	Go to Step 8	Go to Step 3
3	1. Scan tool installed. 2. Turn the ignition switch to the RUN position. 3. Monitor light sensor voltage. Is the voltage at or less than the specified value?	0.137 volts	Go to Step 4	DTC B2647 is intermittent. Refer to *Diagnostic Aids.*
4	1. Turn the ignition switch to the OFF position. 2. Disconnect light sensor. 3. Disconnect Purple TBC connector. 4. Measure resistance between Purple TBC connector terminal A6 and ground. 5. Measure resistance between Purple TBC connector terminal A4 and ground. Does meter display OL (infinite) on circuit 278 or on circuit 705?	—	Go to Step 5	Go to Step 9
5	1. Ignition switch to the OFF position. 2. Light sensor disconnected. 3. Measure resistance between Purple TBC connector terminal A6 and the light sensor harness on circuit 278. 4. Measure resistance between Purple TBC connector terminal A4 and the light sensor harness on circuit 705. Does meter display OL (infinite) on circuit 278 or on circuit 705?	—	Go to Step 10	Go to Step 6
6	1. Replace light sensor. 2. Re-connect all components. 3. Clear DTC's. 4. Turn the ignition switch to the OFF position for ten seconds. 5. Turn the ignition switch to the RUN position. Is DTC B2647 set as a current code?	—	Go to Step 7	Go to Step 11
7	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 11	—
8	Perform DTC B1397 table first and then check for current codes. Is DTC B2647 set as a current code after DTC B1397 table was performed?	—	Go to Step 3	Go to Step 11
9	Repair short to ground on circuit 278 or on circuit 705? Is the repair complete?	—	Go to Step 11	—
10	Repair open in circuit 278 or open in circuit 705. Is the repair complete?	—	Go to Step 11	—
11	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2648 - Ambient Light Sensor Circuit High


Ambient Light Sensor
A
B
0.35 GRY
705
0.35 WHT
278
A4
C3
A6
C3
Truck Body Control Module
5 Volt Reference
Ambient Light Sensor
TBC
C1= BRN
C2= LT BLU
C3= PPL

GG 260630

Circuit Description

The TBC monitors circuit 278 to determine when the headlights lights need to be turned ON when the head lamps are in the AUTO mode. When circuit 278 to the TBC is shorted to battery voltage the TBC will set a related DTC.

Conditions for Setting the DTC

- When circuit 278 is shorted to battery voltage.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The automatic headlight control will be turned ON.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

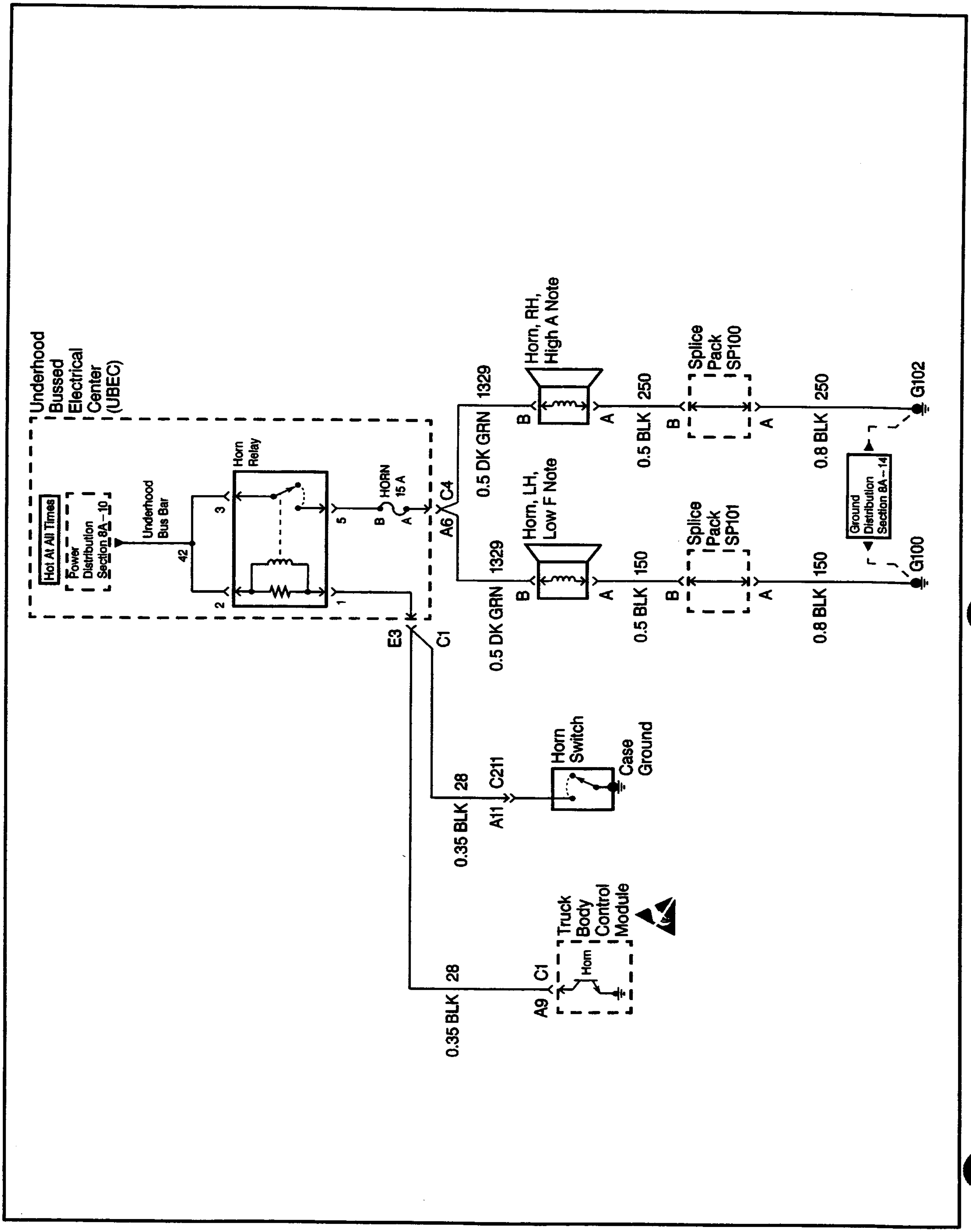
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

4. This step checks the light sensor circuit for a short to battery voltage.

DTC B2648 - Ambient Light Sensor Circuit High

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	Install a scan tool. Is B1398 set as a current code?	—	Go to Step 7	Go to Step 3
3	1. Scan tool Installed. 2. Turn the ignition switch to the RUN position. 3. Monitor TBC light sensor voltage. Is the voltage at or greater than the specified value?	4.78 volts	Go to Step 4	DTC B2648 is intermittent. Refer to *Diagnostic Aids.*
4	1. Turn the ignition switch to the OFF position. 2. Disconnect light sensor. 3. Disconnect Purple TBC connector. 4. Measure voltage between Purple TBC connector terminal A6 and a good ground. 5. Turn the ignition switch to the RUN position. Is the voltage at or greater than the specified value?	4.78 volts	Go to Step 8	Go to Step 5
5	1. Clear DTC(s). 2. Turn the ignition switch to the OFF position for ten seconds. 3. Turn the ignition switch to the RUN position. Is DTC B2648 set as a current code?	—	Go to Step 9	Go to Step 6
6	Replace the light sensor. Is the repair complete?	—	Go to Step 10	—
7	Perform DTC B1398 table first and then check for current codes. Is DTC B2648 set as a current code after DTC B1398 table was performed?	—	Go to Step 3	Go to Step 10
8	Repair short to battery voltage on circuit 278. Is the repair complete?	—	Go to Step 10	—
9	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 10	—
10	Clear DTC(s). Is the action complete?	—	Go to *TBC System Check*	—

DTC B2752 - Horn Relay Coil Circuit Low


Underhood Bussed Electrical Center (UBEC)
Hot At All Times
Power Distribution Section 8A-10
Underhood Bus Bar
42
3
2
Horn Relay
5
1
HORN 15 A
B
A
C4
A6
E3
C1
1329
0.5 DK GRN
B
Horn, RH, High A Note
A
250
0.5 BLK
B
Splice Pack SP100
A
250
0.8 BLK
G102
1329
0.5 DK GRN
B
Horn, LH, Low F Note
A
150
0.5 BLK
B
Splice Pack SP101
A
150
0.8 BLK
G100
Ground Distribution Section 8A-14
28
0.35 BLK
C211
A11
Horn Switch
Case Ground
28
0.35 BLK
C1
A9
Horn
Truck Body Control Module

Circuit Description

Circuit 28 is an input to the TBC. The TBC monitors circuit 28 to determine if the horn circuit is shorted to ground. When circuit 28 is shorted to ground for 184 seconds the TBC will set a related DTC.

Conditions for Setting the DTC

- When circuit 28 is shorted to ground and the TBC is not commanding the horn relay ON.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 184 seconds.

Action Taken When the DTC Sets

- The TBC will store DTC B2752 in memory.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- Check for a sticking horn pad and or/ switch.
- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

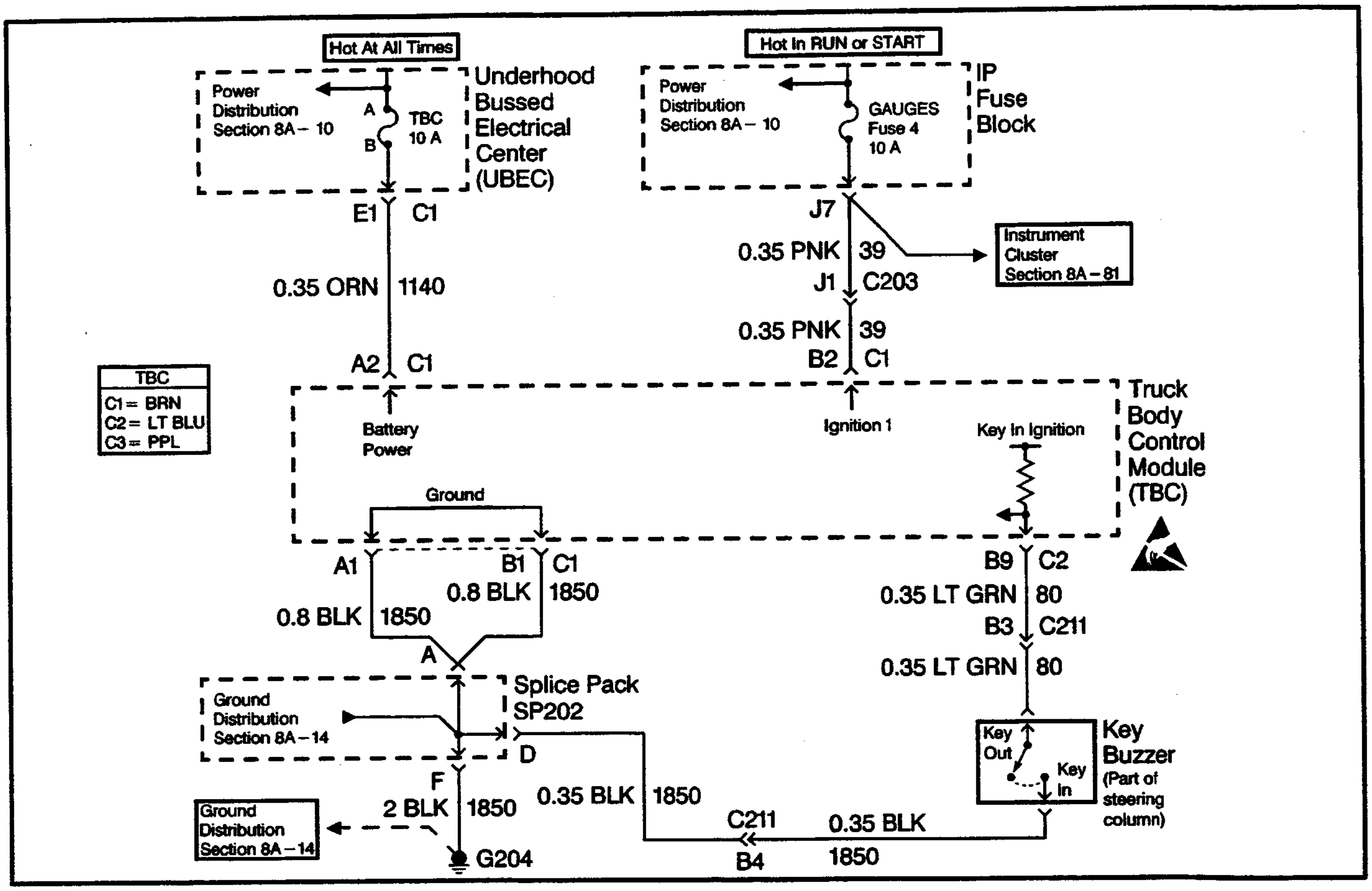
Step number(s) below refer to the same step number(s) in the Diagnostic Table.

3. Checks circuit 28 for a short to ground.
4. Determines if the horn switch is causing the DTC to set.

DTC B2752 - Horn Relay Coil Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Clear DTC(s). 2. Turn the ignition switch to the ON position. 3. DTC should be a current code. 4. Turn the ignition switch to the OFF position. 5. Disconnect Brown TBC connector. 6. Remove Horn relay from UBEC. 7. Measure resistance between Brown TBC connector terminal A9 and ground. Does meter display OL (infinite)?	—	DTC B2752 is intermittent. Refer to *Diagnostic Aids.*	Go to Step 3
3	1. Disconnect 48-way connector at base of steering column. 2. Measure resistance between Brown TBC connector terminal A9 and ground. Does meter display OL (infinite)?	—	Go to Step 4	Go to Step 7
4	Measure resistance between 48-way connector at column side terminals A11 and ground. Does meter display OL (infinite)?	—	Go to Step 5	Go to Step 8
5	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for ten seconds. 4. Turn the ignition switch to the RUN position for 3.5 minutes. Is DTC B2752 set as a current code?	—	Go to Step 6	DTC B2752 is intermittent. Refer to *Diagnostic Aids.*
6	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 9	—
7	Repair a short to ground in circuit 28 between Brown TBC connector and 48-way connector. Is the repair complete?	—	Go to Step 9	—
8	Replace horn switch assembly. Is the repair complete?	—	Go to Step 9	—
9	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

DTC B2961 - Ignition 1 - Key In / Out Mismatch


Hot At All Times
Power Distribution Section 8A-10
A
B
TBC 10 A
Underhood Bussed Electrical Center (UBEC)
Hot In RUN or START
Power Distribution Section 8A-10
GAUGES Fuse 4 10 A
IP Fuse Block
E1
C1
J7
0.35 PNK
39
J1
C203
Instrument Cluster Section 8A-81
0.35 ORN
1140
0.35 PNK
39
A2
C1
B2
C1
TBC
C1= BRN
C2= LT BLU
C3= PPL
Battery Power
Ignition 1
Key In Ignition
Truck Body Control Module (TBC)
Ground
A1
B1
C1
0.8 BLK
1850
0.8 BLK
1850
B9
C2
0.35 LT GRN
80
B3
C211
0.35 LT GRN
80
A
Splice Pack SP202
Ground Distribution Section 8A-14
D
F
2 BLK
1850
0.35 BLK
1850
Key Out
Key In
Key Buzzer (Part of steering column)
Ground Distribution Section 8A-14
C211
0.35 BLK
G204
B4
1850

5308w3276

Circuit Description

The TBC monitors circuit 80 to determine the ignition key is in the ignition switch. The TBC will set a DTC when circuit 80 is shorted to battery voltage or open and the ignition switch has been turned to the RUN position.

Conditions for Setting the DTC

- When circuit 80 is shorted to battery voltage or open and the ignition switch has been turned to the RUN position.
- When the Ignition 1 circuit is shorted to battery voltage and the ignition key is not in the ignition switch.
- Any of the above conditions can exist.
- The system voltage must be between 9.0 volts and 16.0 volts.
- The above conditions must be met for 0.5 seconds.

Action Taken When the DTC Sets

- The Key In warning chime will not function properly.
- The exit lighting will not function properly.

Conditions for Clearing the MIL/DTC

- A current DTC will clear after the next fault free ignition cycle.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History and current DTC(s) can be cleared using a scan tool.

Diagnostic Aids

- A Scan Tool reads class 2 messages with the ignition switch in the RUN position.
- Using a DMM, compare the scan tool values to the actual TBC values.
- Perform a visual check of the wiring and connectors.
- Refer to section 8A-4 for intermittent and poor connections.

Test Description

Step number(s) below refer to the same step number(s) in the Diagnostic Table.

2. This checks the Key In signal to the TBC.
3. This checks the ignition 1 voltage to the TBC.
5. This checks circuit 39 for an open.
8. This checks circuit 80 for an open.
10. This checks circuit 1850 for an open.

DTC B2961 - Ignition 1 - Key In / Out Mismatch

Step	Action	Value(s)	Yes	No
1	Was the TBC Diagnostic System Check performed?	—	Go to Step 2	Go to *TBC System Check*
2	1. Connect a scan tool. 2. Turn the ignition switch to the RUN position. 3. Monitor ignition Key In/ Key Out parameter on the scan tool. Does the scan tool display Key in?	—	Go to Step 3	Go to Step 8
3	1. Turn the ignition switch to the OFF position. 2. Monitor Ignition 1 on the scan tool. Does the scan tool display Inactive?	—	DTC B2961 is intermittent. Refer to *Diagnostic Aids.*	Go to Step 4
4	Check 10 Amp Gauges fuse in I/P fuse block. Is the fuse OK?	10 Amp Fuse #4	Go to Step 5	Go to Step 16
5	1. Disconnect Brown TBC connector. 2. Turn the ignition switch to the OFF position. 3. Measure voltage between Brown TBC connector terminal B2 and ground. Is it approximately battery voltage?	—	Go to Step 19	Go to Step 6
6	1. Turn the ignition switch to the OFF position. 2. Re-connect all components. 3. Clear DTC(s). 4. Turn the ignition switch to the OFF position for ten seconds. 5. Turn the ignition switch to the RUN position. Is DTC B2961 set as a current code?	—	Go to Step 7	DTC B2961 is intermittent. Refer to *Diagnostic Aids.*
7	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 20	DTC B2961 is intermittent. Refer to *Diagnostic Aids.*
8	1. Turn the ignition switch to the OFF position. 2. Disconnect 48-way steering column connector. 3. Disconnect Light Blue TBC connector. 4. Measure resistance between Light Blue TBC connector terminal B9 and 48-way connector terminal B3. Is the resistance at or less than the specified value?	5 ohms	Go to Step 9	Go to Step 13
9	1. Ignition key still In the ignition switch. 2. Measure resistance in ignition lock cylinder circuits of the 48-way harness connector from terminals B3 to B4. Is the resistance at or less than the specified value?	5 ohms	Go to Step 10	Go to Step 14
10	Measure resistance between terminal B4 on 48-way harness connector vehicle side and ground. Is the resistance at or less than the specified value?	5 ohms	Go to Step 11	Go to Step 15

DTC B2961 - Ignition 1 - Key In / Out Mismatch (continued)

Step	Action	Value(s)	Yes	No
11	1. Re-connect all components. 2. Clear DTC(s). 3. Turn the ignition switch to the OFF position for ten seconds. 4. Turn the ignition switch to the RUN position. Is DTC B2961 set as a current code?	—	Go to Step 12	DTC B2961 is intermittent. Refer to *Diagnostic Aids.*
12	1. Replace TBC. 2. Program TBC with the proper calibrations. Is the repair complete?	—	Go to Step 20	—
13	Repair open in circuit 80. Is the repair complete?	—	Go to Step 20	—
14	Replace ignition lock cylinder. Is the repair complete?	—	Go to Step 20	—
15	Repair open or poor ground in circuit 1850. Is the repair complete?	—	Go to Step 20	—
16	Replace the Gauges fuse. Turn the ignition switch to the RUN position. Does fuse blow?	10 Amp Fuse #4	Go to Step 18	Go to Step 17
17	1. Clear DTC(s). 2. Turn the ignition switch to the OFF position for ten seconds. 3. Turn the ignition switch to the RUN position. Is DTC B2961 set as a current code?	—	Go to Step 5	Go to Step 2
18	Repair short to ground in circuit 39. Is the repair complete?	—	Go to Step 20	—
19	Repair open or short to voltage in circuit 39. Is the repair complete?	—	Go to Step 20	—
20	Clear DTC(s). Is the Action complete?	—	Go to *TBC System Check*	—

Repair Instructions

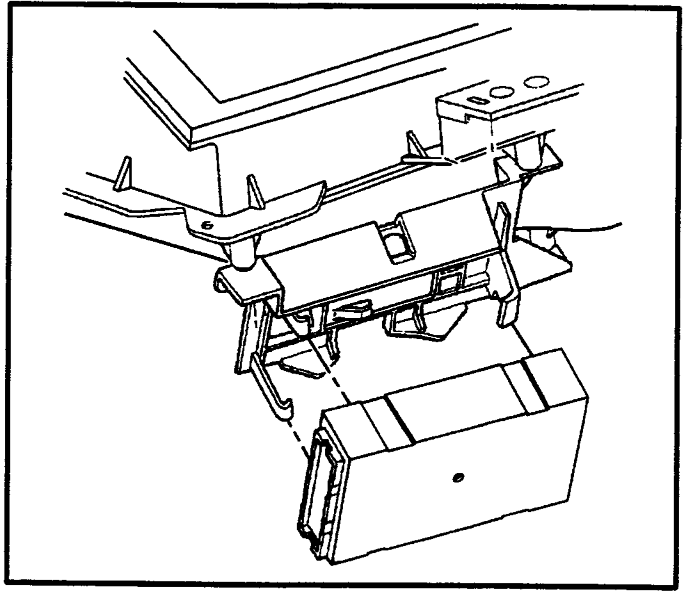
Truck Body Control Module Replacement

The service of the Truck Body Control System may consists of replacing the TBC.

Notice: The ignition switch should be in the OFF position when connecting or disconnecting the connectors to the TBC. Always disconnect the Brown TBC connector FIRST and connect the Brown TBC connector LAST. The TBC can set DTC(s) with the ignition switch in the OFF position. The TBC has battery run down protection for the courtesy lamp circuit. The TBC battery run down protection can not detect shorts on inputs or other circuits which it does not control. The scan tool can be used to put the TBC to sleep in order to check for current draws on circuits which are not controlled by the TBC or controlled by the battery run down protection system. If an excessive current draw is detected refer to the *Parasitic Load test in Section 6, Engine Electrical.*

Remove or Disconnect

Truck Body Control Module

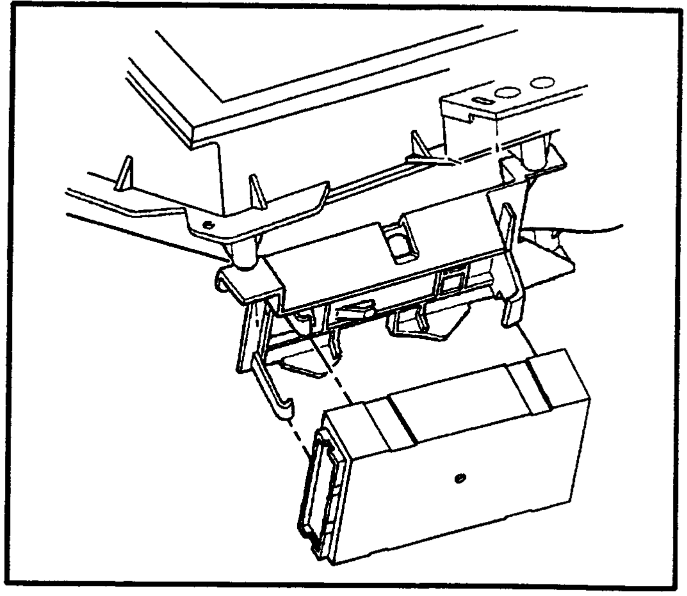


239852

1. Screws from the center and left hush panels.
2. The center and left hush panels.
3. The electrical connectors from the Truck Body Control Module.
4. Bend the 2 snap retainers back slightly and pull the left side of the TBC module forward.
5. Truck Body Control Module from the Bracket at an angle.

Install or Connect

Truck Body Control Module



239852

1. Truck Body Control Module to the Bracket at an angle under the wide hook retainer with the label facing away from the bracket.
2. The module connector end positioned above and between the 2 snap retainers.
3. Slide the module under the wide hook retainer and apply pressure on the left side of the Truck Body Control Module to move it toward the mounting bracket base to snap the module in place.
4. Make sure the module is fully seated with both snap retainers holding the module.
5. The electrical connectors to the Truck Body Control Module.
6. The center and left hush panels.
7. Screws to the center and left hush panels.
8. Program the TBC with the proper calibrations using the Techline and the scan tool.
9. Clear Diagnostic Trouble Codes.

Truck Body Control Module Programming / RPO Configuration

1. Take the following steps in order to prepare for TBC Programming.
   - The battery is fully charged.
   - The Ignition switch is in the RUN position.
   - The battery and cigarette lighter connections are secure.
   - The Data Link Connector (DLC) is accessible.

2. Refer to the latest Techline terminal and equipment user's instructions.
3. If the TBC fails to program, perform the following functions:
   - Check all TBC connections.
   - Check the Techline terminal and equipment for the latest software version.
   - Try again to program the TBC. If it fails again, replace the TBC.

Notice: The ignition switch should always be in the OFF position when installing or removing the TBC. Removing the power circuit(s) or ground circuits from the TBC will cause set a DTC to set.

   - For a functional check, refer to *TBC System Check.*

4. Clear Diagnostic Trouble Codes after the programming is complete.

Wiring Harness Service

The TBC harness electrically connects the TBC to solenoids, switches and sensors in the vehicle engine compartment and in the passenger compartment.

Wire harnesses must be replaced with the proper part number. When splicing signal wires into a harness, wires with high temperature insulation must be used.

Because of the low amperage and voltage levels utilized in truck body control systems, the best possible bond shall be made at all splices. Rosin-core solder must be used in truck body control system wire splices. Refer to *Wire Harness Repair in Section 8A-5.*

Molded-on connectors that are damaged must be replaced. A new connector must be spliced into the harness. Replacement connectors and terminals are listed in Group 8.965 in the Standard Parts Catalog.

Connectors and Terminals

Care must be taken when probing a connector and when replacing terminals. A short between opposite terminals could damage components. Jumper wires must be used between connectors when checking circuits. NEVER probe through Weather-Pack seals. Connector test adapter kit (J 35616-A) is the ONLY recommended method of probing connectors, terminals, and Bussed Electrical Centers. Connector test adapter kit (J 35616-A) contains an assortment of flexible connectors used to probe connectors, terminals, and Bussed Electrical Centers during diagnosis.

Notice: The Probing of electrical circuits without the use of Connector test adapter kit (J 35616-A) could cause damage to electrical components, Bussed Electrical Centers, and connectors.

Fuse remover and test tool (BT-8616), or equivalent, is used for removing a fuse and to adapt the fuse holder to a meter for diagnosis.

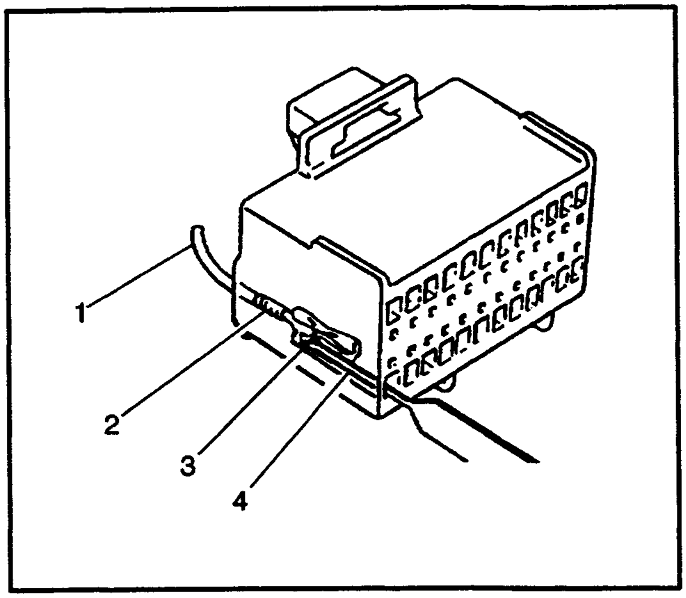
Open circuits may be difficult to locate visually because oxidation or terminal misalignment are hidden by the connectors. Wiggling a connector on a sensor or in the wiring harness may temporarily correct the open circuit. Intermittent problems may be caused by oxidized or loose connections.

Check the type of connector/terminal before making any connector or terminal repair.

Micro-Pack Terminal Removal

Refer to t*he below illustration* for the Terminal Removal procedures of a Micro-Pack connector.

Micro-Pack 100 Terminal Removal



TI 00082

Legend
1. Cable
2. Terminal
3. Locking tang
4. Tool J 33095

Basic Knowledge Required

A basic understanding of hand tools is necessary to effectively use this section of the service manual.

Notice: Lack of basic knowledge of the TBC system while performing diagnostic procedures could result in incorrect diagnostic or damage TBC components. Do not attempt to diagnose a TBC problem without this basic knowledge. Before using this section of the Service Manual there are some areas that you must be familiar with. Without this basic knowledge, you will have difficulty using the diagnostic procedures in this section.

- Basic Electrical Circuits
  The basic theory of electricity is essential. An understanding of voltage, current and resistance and their relationships to each other will help in the diagnosis of an open or shorted circuit. You must be able to read and understand a schematic wiring diagram.

- Use of Circuit Testing Tools
  You must know how to use jumper wires to bypass components to test circuits. You must be familiar with essential tool J 39200 DMM or equivalent. You must be able to measure voltage, resistance, and current with the DMM you are using.

Aftermarket (Add-On) Electrical And Vacuum Equipment

Aftermarket (Add-On) electrical and vacuum equipment is equipment that has been installed on a vehicle's electrical or vacuum systems after the vehicle leaves the factory. This may also include equipment not connected to the vehicle's electrical system such as portable telephones and radios. No allowances have been made in the vehicle design for this type of equipment.

Notice: Add-on electrical equipment must be connected to the vehicle's electrical system at the battery (power and ground).

Add-on electrical equipment, including telephones and radios, installed to these strict guidelines, may still cause the TBC system to malfunction. This may also include equipment not connected to the vehicle's electrical system, such as portable telephones and radios. The first step in diagnosing a TBC problem is to remove add-on electrical equipment from the vehicle. After this is done, if the problem still exists, the problem may be diagnosed in the normal manner.

Visual / Physical Underhood Inspection

One of the most important checks, which must be done before any diagnostic activity, is a careful visual and physical inspection of suspect wiring and components. This can often lead to fixing a malfunction without further steps. An underhood visual and physical inspection can also locate a problem without further steps. Inspect the battery hydrometer (GREEN EYE) to ensure the battery is not discharged. Inspect all electrical circuits for pinches, cuts or disconnects. This visual inspection is very important. It must be done carefully and thoroughly.

Check for proper installation of aftermarket electronic equipment which may affect the integrity of other systems.

The inspection must cover the battery, vacuum hoses, and wiring as follows:

- TBC grounds - dirty, loose and in the wrong location.
- Wiring - loose connections, pinches and cuts.
- Splice Pack grounds - dirty, loose and in the wrong location.

Diagnostic Information

The Diagnostic Trouble Code (DTC) tables in this section are used to locate a faulty circuit or component through the process of elimination. The TBC performs a continual self diagnosis on certain control functions. A DTC will set when a malfunction is detected by the TBC. The TBC will NOT turn the SERVICE SOON Malfunction Indicator Lamp (MIL) lamp ON.

Class 2 Serial Data Communication

The messages carried on Class 2 data streams are prioritized. In other words, if two messages attempt to establish communications on the data line at the same time, only the message with higher priority will continue. The device with the lower priority message must wait.

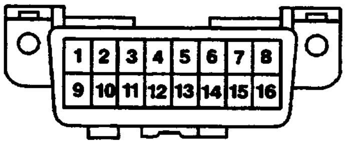
The class 2 network continually monitors various subsystems, (i.e. TBC, IPC, BPCM, and ABS) and operating conditions for possible system malfunctions. By comparing system conditions against standard operating limits, certain circuit and component malfunctions can be detected. A five digit alphanumeric Diagnostic Trouble Code (DTC) is stored in computer memory. When a malfunction is detected by this self diagnostic system. The DTC(s) can later be retrieved by the service technician with a scan tool. The scan tool can aid the technician in repairing various subsystems.

Data Link Connector (DLC)

The sixteen pin DLC is wired to the Truck Body Control Module and is located under the dash panel on the left side. The DLC connector has terminals that are used to connect to a scan tool. Some common uses of the scan tool are listed below:

- Identifying stored Diagnostic Trouble Codes (DTCs).
- Clearing DTCs.
- Performing output control tests.
- Reading serial data.

Data Link Connector (DLC)



TI 00085

Scan Tool Diagnosis

The Scan Tool can be used to monitor the communications between the TBC, the BPCM and the PIM. The scan tool can also display data for these modules. The DATA LIST display is under the applicable selections. These lists shows the status of the hardwired connections and the Class 2 values for these modules. These scan tool values can be very useful in diagnosing the below systems.

- Power Inverter Module (PIM)
- Truck Body Control Module (TBC)
- Battery Pack Control Module (BPCM).

Scan Tool Information Modes

- On the scan tool there are four modes available in the **Body Control Module** selection. Select **Body Control Module, Data Display** and **Data List**. The following list appears:
- Data
- Input 1
- Input 2
- Outputs

The scan tool allows for the display Class 2 values or the state of components commanded by the various systems (i.e. TBC, IPC, ABS, and BPCM). The Tests available are dependent upon the system selected, but may include the following:

- Data (Analog Inputs): Displays analog values as seen by the system.
- Inputs (Digital Inputs): Displays digital values as seen by the system and provides an indication of whether the input has cycled.
- Outputs (Digital Outputs): Allows for digital outputs controlled by the TBC system to be turned OFF/ON.
- Special Functions (Analog Outputs): Allows for analog outputs of the TBC system to be set at a desired value.
- Clear Diagnostic Trouble Codes: Will erase all DTC(s) stored for the system currently selected (Note: if the malfunction is still present, the DTC may immediately reset).

The Diagnostic Executive

The Diagnostic Executive is a unique segment of software which is designed to coordinate and prioritize the diagnostic procedures as well as define the protocol for recording and displaying their results. The Diagnostic Executive also receives diagnostic test results and records the pass and fail status. The main responsibilities of the Diagnostic Executive are:

- Monitoring the Diagnostic Test Enabling Conditions.
- Recording Pending, Current, and History DTC(s).
- Monitoring and Recording Test Status information.
- Recording pass and fail status of test results.

A **diagnostic test** is a series of steps which has a beginning and end. The result of which is a pass or fail reported to the Diagnostic Executive. When a diagnostic test reports a pass result, the Diagnostic Executive records the following data:

- The fault identified by the diagnostic test is not currently active.

When a diagnostic test reports a fail result, the Diagnostic Executive records the following data:

- The fault identified by the diagnostic test is currently active.
- The fault identified has been active since the last 100 ignition cycles or since the codes have been cleared.
- Code supported BIT is enabled.

Diagnostic Trouble Code (DTC) Diagnosis

This section uses diagnostic tables, wiring diagrams and descriptive text to direct you in performing specific tests to locate and repair the problem. The diagnostic table is a step by step procedure to determine the circuit or component that is the source of the problem. The wiring diagrams and text describing the system, test conditions, failure conditions and actions taken when a DTC is set are located on the page facing the diagnostic table.

Diagnostic Trouble Codes (DTC)s, when set, indicate that the TBC has detected a malfunction in a particular circuit or other system. Other system malfunctions are generally, but not exclusively, reported to the TBC via Class 2 data message. The TBC is programmed with routines for internal checks that it follows only under prescribed conditions (called Test Conditions). When these conditions exist, the TBC checks certain circuits or systems for a malfunction. These checks are called failure conditions or conditions for setting the DTC. When these conditions are true, a DTC is set. Refer to the *Applicable DTC Table* for procedures and details.

Reading Diagnostic Trouble Codes DTC(s) With a Scan Tool

The TBC does NOT turn ON the SERVICE SOON Malfunction Indicator Lamp (MIL). The recommended method for reading DTC(s) stored in memory, is by using a scan tool plugged into the DLC connector located under the instrument panel on the left side. Follow the scan tool instructions supplied by the tool manufacturer. The DTC(s) will be stored in the memory of the Truck Body Control Module (TBC) as a Current or History DTC.

Current Codes

When the TBC determines that the test conditions and failure conditions for a particular DTC are true and it is during the current wake up cycle, it sets the code as a Current DTC. All DTC(s) remain current until the next fault free wake up cycle and the TBC finds the test conditions are true and the failure conditions are false. The Current code then will become a History code only.

History Codes

When a DTC reports a failure and the failure was not in the current wake up cycle it will be stored as a History DTC Code. The TBC performs internal diagnostic tests to acknowledge that the related systems have reported a pass or fail condition. Each diagnostic test that fails is recorded in the TBC memory. The TBC memory can be accessed with a scan tool to determine which DTC circuit was at fault.

A history DTC can be cleared (for any diagnostic test) as follows:

- Completing 100 subsequent ignition cycles with no diagnostic test reporting a fail.
- Using a scan tool.

NOTICE: Disconnecting the battery or disconnecting the TBC connectors will NOT clear History DTC(s). It may cause other DTC(s) to set due to a loss of power or ground to the TBC.

After Diagnosis is Complete

After diagnosing a problem, in addition to repairing the discovered malfunction, clear any DTC(s) set and verify proper operation. To verify proper operation, you must duplicate the conditions when the customer's complaint occurred or if a DTC was set, you must duplicate the test conditions for that DTC (listed on the facing page of the Diagnostic Trouble Code table) and refer to conditions for setting the DTC. The DTC should not re-set after the repair has been made.

Clearing Diagnostic Trouble Codes DTC(s)

A DTC can NOT be cleared from the memory of the TBC by disconnecting the battery or by disconnecting the TBC electrical connectors. A DTC can be cleared from the memory of the TBC by using the Scan tool or after 100 concurrent ignition cycles have occurred without the fault reoccurring. Clearing DTC(s) from the TBC memory is necessary after a repair has been made or to check if a malfunction will occur again. If the fault still exists the DTC will re-set after clearing DTC(s).

NOTICE: The ignition switch should be in the OFF position when connecting or disconnecting the connectors to the TBC. Always disconnect the Brown TBC connector FIRST and connect the Brown TBC connector LAST. The TBC can set DTC(s) with the ignition switch in the OFF position. Disconnecting the battery or disconnecting the TBC connectors will NOT clear DTC(s). It may cause other DTC(s) to set due to a loss of power or ground while the TBC is Awake.

Tools Needed to Service the System

You must know how to use jumper wires to bypass components to test circuits. You must be familiar with the Digital Multimeter (DMM). You must be able to measure voltage, resistance, and current with an DMM.

System diagnosis requires a scan tool, test light, DMM with 10 Meg-ohms impedance (J 39200), Connector test adapter kit (J 35616-A) and jumper wires. A test light or a voltmeter must be used only when specified in the procedures. Refer to *Special Tools in this Section.*

Description and Operation

Truck Body Control Module General Description

Before using this section of the manual, you should be familiar with the information and proper diagnosing procedures as described in the section. This section contains a Truck Body Control Module (TBC) diagnostic system check. The TBC diagnostic system check is an organized approach in order to identify the root cause reported by a Truck Body Control Module system malfunction code. The TBC diagnostic system check must be the starting point for any Truck Body Control Module complaint diagnosis. The TBC diagnostic system check will direct you to the next logical step in diagnosing the complaint. Understanding the table and using it correctly will reduce diagnostic time and prevent unnecessary replacement of good parts.

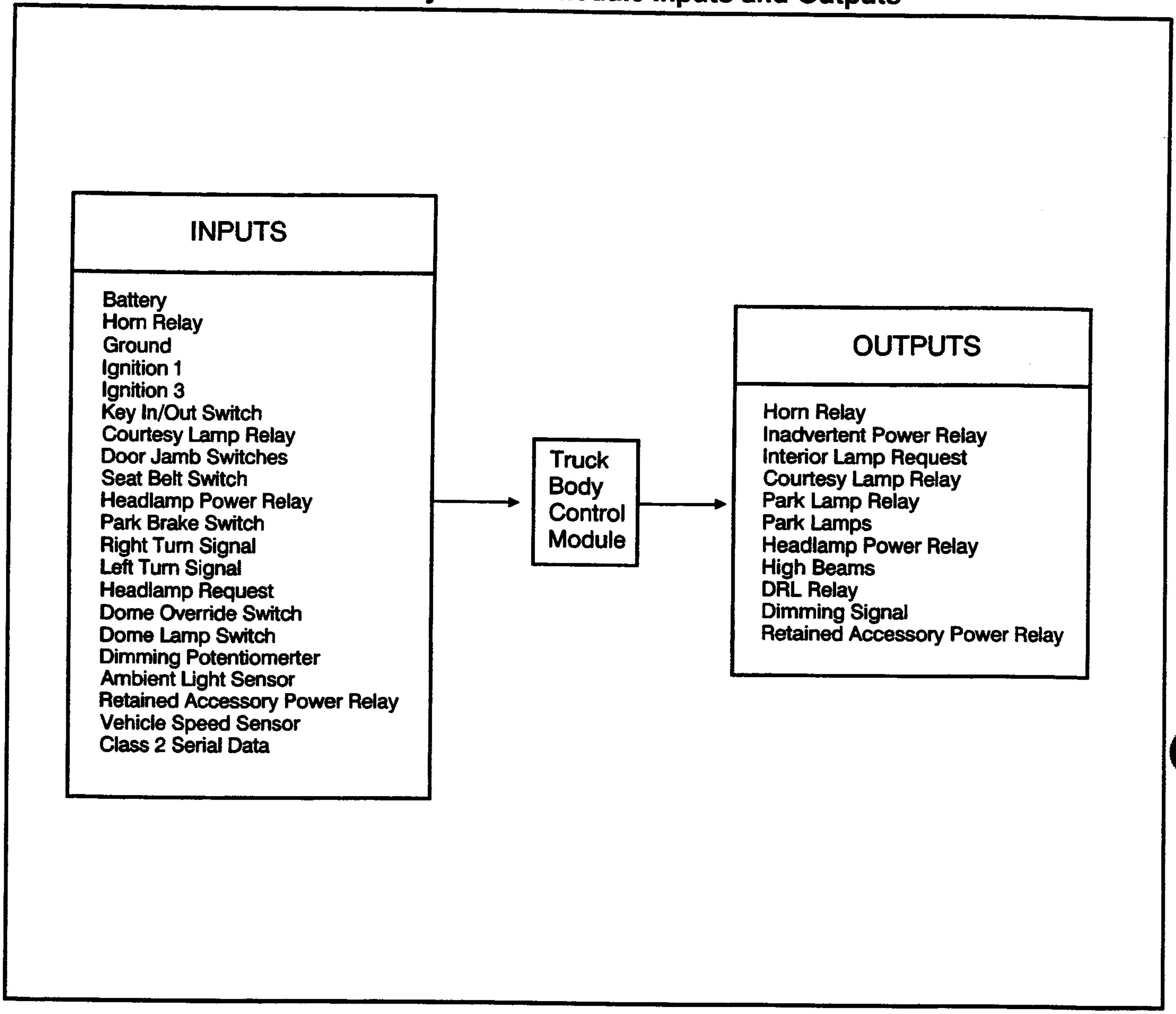
Truck Body Control Module System Description

The Truck Body Control Module (TBC) is designed to process various input information and send the necessary electrical responses to the other control modules. The input information has an interrelation to more than one output, therefore, if one input fails it can affect more than one systems operation.

The TBC also controls the operation of audible reminders, warnings, interior and exterior illumination. The Truck Body Control Module has features which may time out and turn OFF inadvertent loads and to provide retained accessory power. Finally, the Truck Body Control Module communicates via a Class 2 Serial data bus for diagnostics and for being programmed at the assembly plant or at an approved service center.

The Truck Body Control Module supplies a buffered voltage to various sensors and switches through an internal resistance in the Truck Body Control Module. The resistance is so high in value that a test light may not turn ON when connected to the circuit. An ordinary shop voltmeter may not give an accurate reading because the voltmeter input impedance is too low. Use a 10 Meg-Ohm input impedance Digital Mulimeter (J 39200) to ensure accurate voltage readings. Refer to *Special Tools* at the end of this Section.

Truck Body Control Module Inputs and Outputs


INPUTS
Battery
Horn Relay
Ground
Ignition 1
Ignition 3
Key In/Out Switch
Courtesy Lamp Relay
Door Jamb Switches
Seat Belt Switch
Headlamp Power Relay
Park Brake Switch
Right Turn Signal
Left Turn Signal
Headlamp Request
Dome Override Switch
Dome Lamp Switch
Dimming Potentiomerter
Ambient Light Sensor
Retained Accessory Power Relay
Vehicle Speed Sensor
Class 2 Serial Data
Truck Body Control Module
OUTPUTS
Horn Relay
Inadvertent Power Relay
Interior Lamp Request
Courtesy Lamp Relay
Park Lamp Relay
Park Lamps
Headlamp Power Relay
High Beams
DRL Relay
Dimming Signal
Retained Accessory Power Relay

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Truck Body Control Module Service Precautions

Do not use a test light to diagnose the TBC electrical systems unless specifically instructed by diagnostic procedures. Use the connector test adapter kit (J 35616) when diagnostic procedures require probing of connectors.

Notice: The Probing of electrical circuits without the use of Connector test adapter kit (J 35616-A) could cause damage to electrical components, Bussed Electrical Centers, and connectors. Refer to Special Tools in this section.

The Truck Body Control Module (TBC) will withstand normal current draws associated with vehicle operations. Avoid overloading any circuit. When testing for opens or shorts, do not ground or apply voltage to the TBC circuits unless instructed to do so. These circuits may only be tested using a Digital Multimeter (DMM) J 39200 or equivalent. Electrical circuits should be tested with a DMM, while the TBC connectors remain connected to the TBC or the recommended breakout box. Never remove or apply voltage to the TBC with the key in the RUN position. Before removing or connecting battery cables, fuses or connectors always turn the key to the LOCK position. Whenever a TBC removal and replacement is performed, follow the instructions in this section. Always disconnect the Brown TBC connector FIRST and connect the Brown TBC connector LAST when servicing the TBC system. The TBC can set codes with the ignition switch in the OFF position. Disconnecting the electrical connectors from the TBC will set DTC(s). It can take the TBC 20 minutes (1216 seconds) to power down after the ignition switch has been turned to the OFF position and the TBC is not receiving any active inputs and does not receive any active inputs for 20 minutes.

Truck Body Control Module System Circuit Description

Wake-Up State

Wake-Up signals that will turn the TBC ON and cause it to begin active control and/or monitoring certain devices. The TBC Wake-ups are:

Door Ajar Switches

Dome Lamp

Park Lamps

Interior Lamp Request Active

Ignition Key put into the Ignition Switch

Ignition Key removed from the Ignition Switch

Ignition in the RUN Position

Any Class 2 communication requiring TBC interaction.

Asleep States

The TBC is Asleep when it has stopped controlling or monitoring devices and has become idle again.

After the ignition Switch is turned to the LOCK position and 20 minutes (1216 seconds) elapse without any Wake-Up signals, the TBC enters into an Asleep state and goes into the Low Power Mode. If the TBC is in Low Power Mode and detects a Wake Up, the TBC will enter into the Wake-Up state and enter the High Power Mode. If the vehicle has been left inactive (ignition in the LOCK position and no TBC wake-ups) for 20 minutes, the TBC will return to the Low Power Mode.

Ambient Light Level Sensor

The Ambient Light Level Sensor has two states. The states are LIGHT and DARK. If the Head Lamp switch is set to AUTO while in the LIGHT state, the Radio, and PRND will stay fully bright. If the Head Lamp switch is set to PARK LAMP or HEAD LAMP position while in the LIGHT state, the Radio, and the PRND will Dim with Dimming Control.

If the Head Lamp switch is set to AUTO or PARK LAMP or HEAD LAMP position while in the DARK state, the Radio, and the PRND will Dim with Dimming Control.

Daytime Running Lights and Auto Head Lamps

In the LIGHT State

If the Head Lamp switch is set to the AUTO position while in the LIGHT state, the Daytime Running Lights (DRL) are ON. If the Park Brake is then SET, the DRL's will turn OFF. When the park brake is RELEASED the DRL's will turn back ON.

If the Head Lamp switch is set to the PARK LAMP position while in the LIGHT state, the DRL's will be ON and the Park Lamps will be ON.

If the Head Lamp switch is set to the HEAD LAMP position while in the LIGHT state, the DRL's will be OFF, the Park Lamps will be ON and the Head Lamps will be ON.

If the Head Lamp switch is set to the HEAD LAMP position while in the LIGHT state and the HIGH / LOW beam switch is toggled, the DRL's will be OFF, the Park Lamps will be ON, the Head Lamps will be ON and the HIGH / LOW beams will toggle with the HIGH / LOW beam switch.

If the Head Lamp switch is set to the AUTO position while in the LIGHT state the and the Ambient Light Level conditions change to DARK for 15 seconds then the TBC will turn the Head Lamps ON.

In the DARK State

If the Head Lamp switch is set to the AUTO position or the PARK LAMP position or to the HEAD LAMP position while in the DARK state the Daytime Running Lights (DRL's) are OFF, the Park lamps will be ON and the Head Lamps will be ON. If the HIGH / LOW Beam Switch is toggled the HIGH / LOW Beams will toggle with the HIGH / LOW beam switch.

When the Ignition Switch is in the OFF position and the Park Brake is SET, the DRL's will be OFF, the Park Lamps will be OFF and the Head Lamps will be OFF. Turning the Ignition switch to the RUN position will defeat the Auto Head Lamps. If the Park Brake is then RELEASED the Auto Head Lamps will function. If the Park Brake is SET again at this time there will be no change in the Head Lamp function.

If the Head Lamp switch is set to the AUTO position while in the DARK state the and the Ambient Light Level conditions change to LIGHT for 20 seconds, the TBC will turn the Head Lamps OFF.

Battery Run Down Protection

The Battery Run Down Protection provides protection against parasitic loads and excessive battery drain and high current loads related to the Courtesy Lamp Circuit. The Battery Run Down Protection will also protect the battery against being run down from the Courtesy Lamp Circuit to the level which will not allow the vehicle to start. The TBC will turn OFF the Courtesy Lamp Circuit after the Ignition Switch is turned from the RUN position to the OFF position and 20 minutes (1216 seconds) have elapsed and without a Lamp Request Input.

One of the following conditions must be met in order to return the TBC to normal operation once the Battery Run Down Protection has shut the interior lamps OFF.

- Shut OFF all lamps and close all doors.
- Turn the ignition switch from the OFF position to the ON position.

Inadvertent Power Relay

The TBC turns OFF Inadvertent Power Relay after 20 minutes (1216 seconds) to preserve battery power. The 20 minute timer starts after any one of the following:

- Ignition switch is turned from RUN or START to UNLOCK, LOCK or ACC
- Illuminated Entry is activated
- Interior Lamps switch is turned ON
- Under hood lamp is activated
- Courtesy lamp is activated
- Dome lamp is activated
- Glove box lamp is activated.

If any one of the below inputs reoccur during the 20 minute timer period, the timer is reset to 20 minutes (1216 seconds).

- Ignition switch is turned from RUN or START to UNLOCK, LOCK or ACC
- Illuminated Entry is activated
- Interior Lamps switch is turned ON
- Courtesy lamp is activated
- Dome lamp is activated.

Retained Accessory Power (RAP)

The RAP feature allows the Entertainment System to be operated after the Ignition Switch is turned from RUN position to the LOCK position, provided that the vehicle's battery voltage is above the minimum voltage threshold when the ignition switch is turned to the OFF position. The Entertainment System will be turned OFF when any door is OPENED or after 20 minutes (1198 seconds) have elapsed since the last Ignition Switch transition. Refer to *Section 8A-15* for more information on the Retained Accessory Power system.

Illuminated Entry

Interior Lights will illuminate for 15 seconds under any of the conditions listed below:

- Open and close the drivers side door.
- Open and close the passenger side door.

Interior Illumination

Interior Lights will illuminate continuously if the Dome Override Button is OFF and any door is OPENED or, if the Dome Lamp (thumb wheel) Switch is turned to the FULL UP (Dome Lamp) position for interior illumination.

Exit Lighting

Interior Lights will ILLUMINATE for 40 seconds when the Ignition Key is REMOVED from the Ignition Cylinder.

Audible Warnings

When the TBC determines a Driver Warning Sound is needed, the TBC will sound the Chime when applicable.

Key In Reminder

The Chime will Sound when the ignition switch is not in the RUN or CRANK position and the Ignition Key is in the Ignition Key Cylinder and the Drivers Door is OPENED. Refer to *Section 8A-76 - Audible Warnings.*

Head Lamp Reminder

The Chime will Sound when the Head Lamp Switch is in the PARK LAMP or HEAD LAMP position and the Dome Lamp Switch (thumbwheel) is not at the FULL DOWN (MAX DIM) position and the Ignition Switch is in the OFF position or ACC position. If the Dome Lamp Switch is in the FULL DOWN position (MAX DIM) and the Head Lamps are Turned ON manually and the ignition key is removed the Head Lamp Reminder chime will not sound. Refer to *Section 8A-76 - Audible Warnings.*

Seat Belt Reminder

The Chime will sound for 6 seconds when the Ignition Switch is turned from the OFF position to the RUN position and the Seat Belt is UNFASTENED. The Seat Belt Telltale on the IPC will also turn ON. Refer to *Section 8A-76 - Audible Warnings.*

Turn Signal Reminder

The Chime will Sound when the Right or Left Turn Signal is turned ON for more than 0.75 miles. The Chime will be synchronous with the Turn Signal Flasher. Refer to *Section 8A-76 - Audible Warnings.*

Driver Warning Telltales

The TBC sends requests to the Instrument Panel Cluster (IPC) to turn the IPC Telltales ON or OFF. These requests are sent on the Class 2 serial data line. If the IPC can not communicate with the TBC via Class 2 the IPC will turn the SERVICE NOW Telltale ON steady. The list of messages sent by the TBC to the IPC are as follows:

Park Brake

Seat Belt

Service Now

Turn Signal Reminder

High Beam ON Indicator.

Exterior Lighting Control

The TBC can turn ON some of the Exterior Lighting independently of the Exterior Lighting System. The vehicles lighting system also can control the same lighting components. The following list indicates which Exterior Lighting Components the TBC can turn ON.

- Low Beams and Park Lamps
- High Beams
- Daytime Running Lamps.

Interior Lighting Control

The TBC can turn ON some of the Interior Lighting independently of the Interior Lighting System. The vehicles lighting system also can control the same lighting components. The TBC provides the following Interior Lamp Control:

- Courtesy lamps
- Illuminated Entry Control of Courtesy Lamps
- Vanity lamp is activated
- Courtesy lamp is activated
- Dome lamps
- Glove box lamp
- Reading lamps
- Inside Rear View Mirror Lamps.

Courtesy Lamps are enabled by the following inputs:

- Discrete input to the TBC from the door jamb switches or Dome Lamp input.

Segment Check

The purpose of illuminating the IPC is to verify all segments of the Telltale displays are working. The turn signal indicators do not turn ON during this check. Further diagnosis should not be attempted unless all segments appear, as this could lead to misdiagnosis. If any portions or segments of the IPC displays are inoperative, the IPC must diagnosed first. Refer to *Section 8C and 8C1.*

Special Tools and Equipment

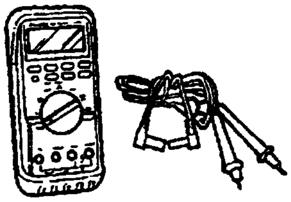
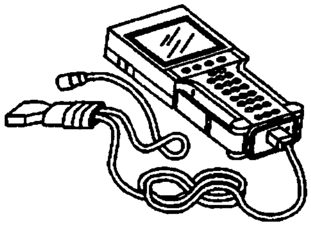
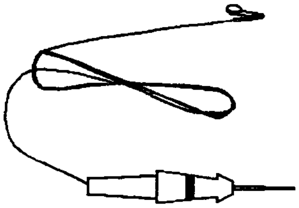
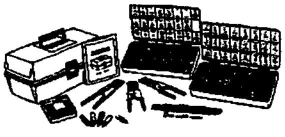
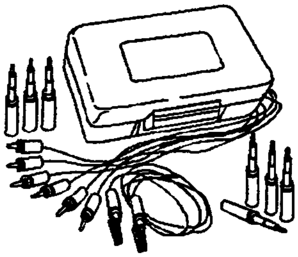
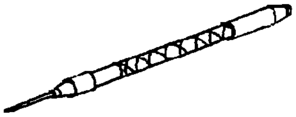
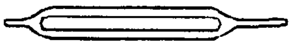
Illustration	Part No. /Description
	J 39200 Digital Multimeter
	7000081 Scan Tool
	J 34142-B 12 Volt Test Light
	J 38125-A Packard Terminal Repair Kit

Illustration	Part No. /Description
	J 35616-A Connector Test Adapter Kit
	J 35689-A Metri-Pack Terminal Remover
	J 33095 Control Module Connector Terminal Remover

SECTION 8E1

WINDSHIELD WIPER/WASHER SYSTEM

GENERAL DESCRIPTION

WIPER/WASHER SYSTEM

The windshield wiper/washer system consists of a permanent-magnet wiper motor assembly, a transmission assembly, wiper arm and blade assemblies, a washer pump and a solvent level sensor mounted on a washer solvent container, and a wiper/washer switch assembly.

Pulse and timing functions, along with the demand wash function, are controlled by a printed circuit board in the wiper motor cover assembly. The wiper motor is also equipped with RFI (radio frequency interference) suppression.

CIRCUIT OPERATION

Figures 1 and 2

Wiper Operation

In addition to the features of a conventional (non-pulse) wiper system (mist, low, and high speeds), the pulse-type windshield wiper/washer system includes an operating mode in which the wipers make single sweeps with a time interval between sweeps. The time interval is controlled by a solid-state timer in the wiper motor cover assembly. The duration of the delay interval is determined by the delay resistor in the wiper/washer switch assembly.

When the wiper switch is turned off, the wiper motor returns the wipers to the park position.

Pulse Operation

With the wiper switch in "DELAY" (pulse), battery voltage is applied to the wiper motor connector at terminal "C" through CKT 143. Voltage also is applied to terminal "A" through CKT 113 and terminal "E" through CKT 112.

The length of delay time between sweeps is controlled by the variable-pulse delay resistor. Delay is adjustable from 1 to 22 seconds, nominally.

Low-Speed Operation

In the "LO" position of the wiper switch, battery voltage is applied to the wiper motor connector at terminal "C" through CKT 143, terminal "E" through CKT 112, and terminal "A" through CKT 113.

The circuit board supplies power to the wiper motor which runs continuously through the low-speed relay.

High-Speed Operation

In the "HI" position of the wiper switch, battery voltage is applied at terminal "C," "D," and "E" of the wiper motor assembly through CKTs 143, 92, and 112. Voltage is also applied to terminal "A" through CKT 113.

Park Position Operation

When turned "OFF" from any position, the wipers complete the last sweep and park. When the wiper switch is in "OFF," the wiper motor assembly has battery voltage applied to terminal "C" only, from CKT 143. The wiper motor continues to run until the park switch opens.

Washer Operation

When the washer switch is turned to "ON," battery voltage is applied to terminal "A" of the wiper motor assembly through CKT 113. The washer switch also applies voltage to the washer pump through CKT 228. The wiper motor has voltage applied through the low-speed relay and operates at low speed for 2 to 4 wipes.

When the washer switch is held on, the wiper motor circuit board will keep the washer pump on only as long as the washer switch is held on.

If the wipers had been in "DELAY," "LO," or "HI," they would return to that operation after the wash cycle. If in "OFF," they then return to park position after 2 to 4 wipes.

Mist Operation

When the wiper switch is moved to "MIST" and released, the wipers make one sweep at low speed and return to park position. If the wiper switch is held in "MIST," the wipers will continue to operate until the switch is released. The circuit operation is the same as that of low speed.

WIPER MOTOR ASSEMBLY DIAGNOSIS

COMPONENT LOCATIONS

- Refer to the CHASSIS/BODY ELECTRICAL SECTION for a list of component locations.

TROUBLESHOOTING HINTS

Figure 1

- Make the following checks before beginning System Diagnosis.

1. Check wiper fuse. If open, check for short to ground through CKT 143 and replace fuse.

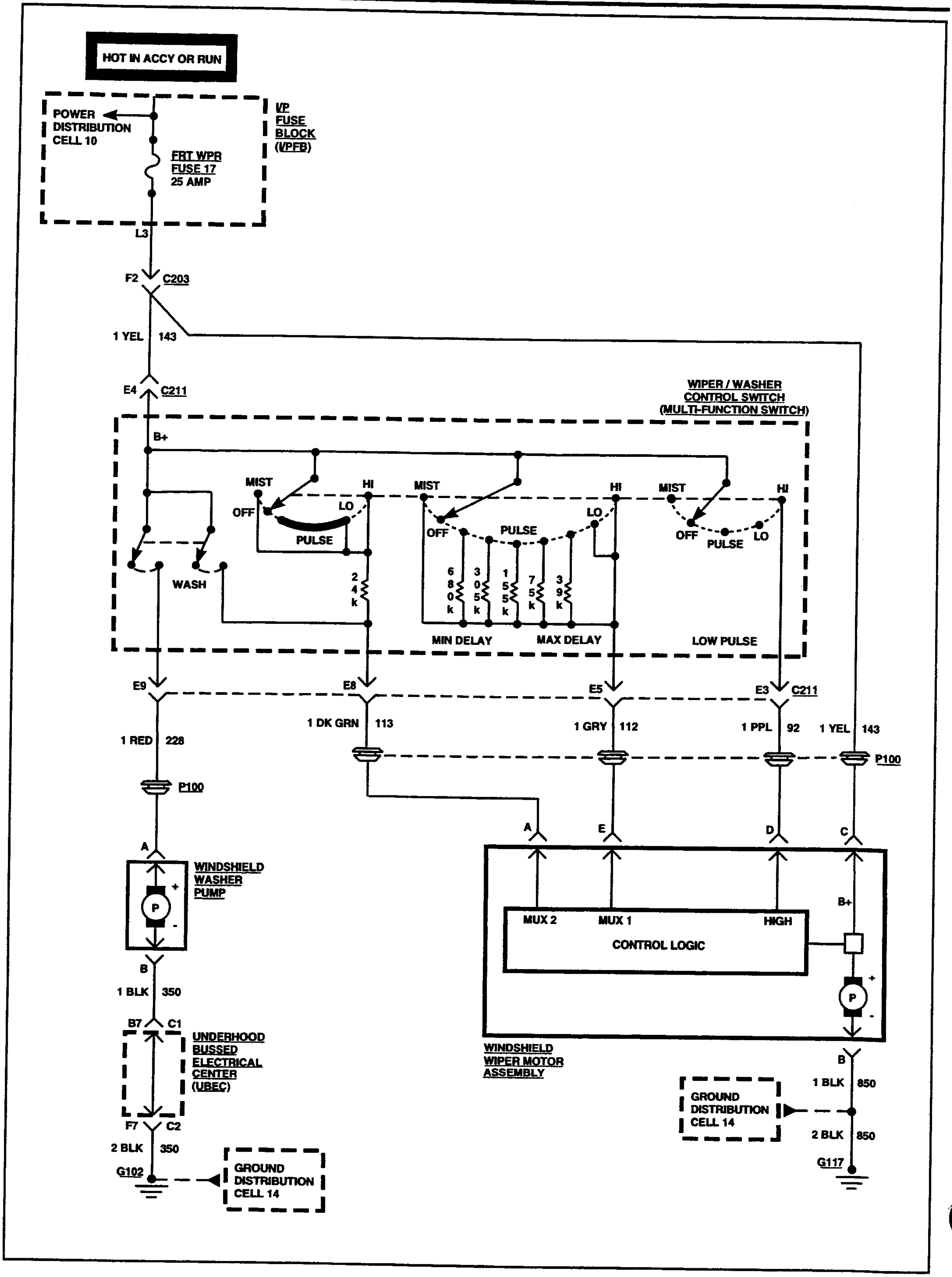

HOT IN ACCY OR RUN
POWER DISTRIBUTION CELL 10
I/P FUSE BLOCK (I/PFB)
FRT WPR FUSE 17 25 AMP
L3
F2
C203
1 YEL
143
E4
C211
WIPER / WASHER CONTROL SWITCH (MULTI-FUNCTION SWITCH)
B+
MIST
HI
OFF
LO
PULSE
MIST
HI
OFF
PULSE
LO
MIST
HI
OFF
PULSE
LO
WASH
24k
680k
305k
155k
75k
39k
MIN DELAY
MAX DELAY
LOW PULSE
E9
E8
E5
E3
C211
1 DK GRN
113
1 GRY
112
1 PPL
92
1 YEL
143
1 RED
228
P100
P100
A
WINDSHIELD WASHER PUMP
P
+
-
A
E
D
C
B+
MUX 2
MUX 1
HIGH
CONTROL LOGIC
P
+
-
B
1 BLK
350
B7
C1
UNDERHOOD BUSSED ELECTRICAL CENTER (UBEC)
F7
C2
2 BLK
350
G102
GROUND DISTRIBUTION CELL 14
WINDSHIELD WIPER MOTOR ASSEMBLY
B
1 BLK
850
GROUND DISTRIBUTION CELL 14
2 BLK
850
G117

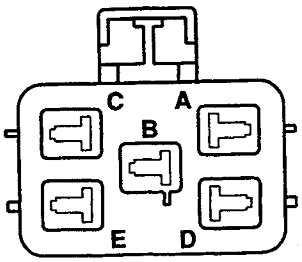
Figure 1 — Wiper/Washer System Electrical Schematic

2. Check that all system connectors are mated firmly.
3. If washer does not operate, check that:
   - — Washer solvent container is filled.
   - — Hoses are correctly attached.
   - — Hoses are not cut, kinked, or pinched.
   - — Nozzles are not clogged.
   - — Connector seal at washer pump is not damaged or missing.
4. Check for binding or broken wiper arm transmission.

- Refer to System Diagnosis.

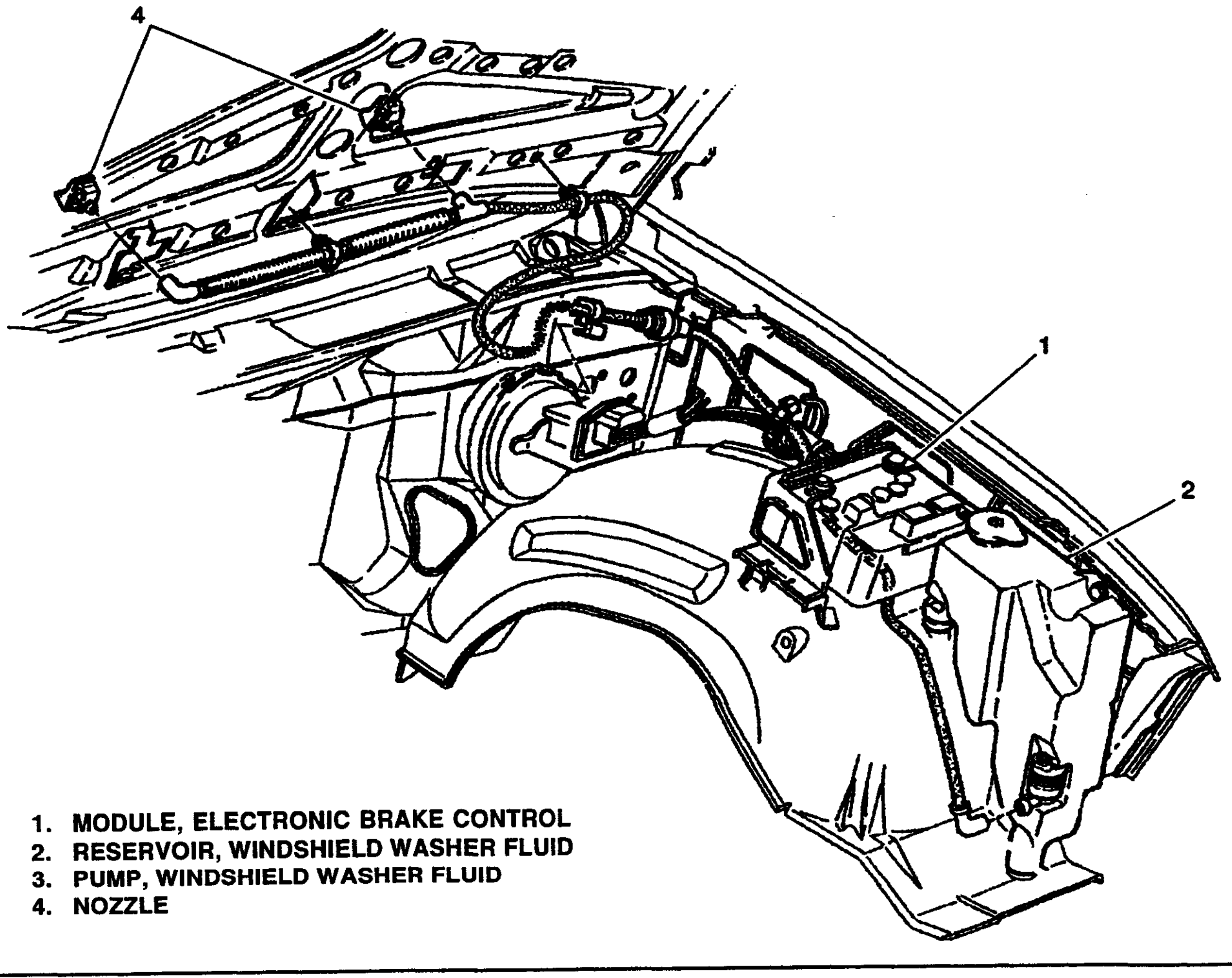
SYSTEM DIAGNOSIS

- Perform the Wiper/Washer System Check (Figure 4); then refer to the Symptom Table (Figure 5) for the appropriate diagnostic procedures.



A	DK GRN
B	BLK
C	YEL
D	PPL
E	GRY

Figure 2 — Wiper Motor Wiring Harness Connector



1. **MODULE, ELECTRONIC BRAKE CONTROL**
2. **RESERVOIR, WINDSHIELD WASHER FLUID**
3. **PUMP, WINDSHIELD WASHER FLUID**
4. **NOZZLE**

Figure 3—Washer Hose Routing

WASHER HOSE ROUTING

Washer hose routing begins at two hood-mounted nozzles (Figure 3). The one-piece washer hose clips to the inside of the hood and left side of the brake booster flange. Solvent passes through a strainer assembly near where the left fender and cowl join. Routing continues along the left fender, then terminates at the washer solvent container.

ACTION	NORMAL OPERATION
[1] • Turn ignition switch to "RUN." • Press washer switch to ON.	Wipers operate at low speed. Washer sprays windshield as long as washer switch is held ON. After releasing switch, washer stops and wipers return to park position after 2 to 4 sweeps.
[2] • Turn wiper switch to "DELAY" (pulse mode).	Wipers make one complete sweep, then pause for 1 to 22 seconds before making next sweep. The pause time is adjusted by turning the wiper switch through the delay range.
[3] • Wiper switch in "DELAY." • Press washer switch to ON.	Washer sprays windshield as long as washer switch is held ON. Wipers run at low speed while spraying and continue for 2 to 4 sweeps after washer switch is released. Wipers then return to pulse operation.
[4] • Turn wiper switch to "LO."	Wipers run continuously at low speed.
[5] • Turn wiper switch to "HI."	Wipers run continuously at faster speed.
[6] • Turn wiper switch to "OFF."	Wipers return to park position at low speed.
[7] • Turn wiper switch to "MIST," then release.	Wipers make one complete sweep, then return to park position.

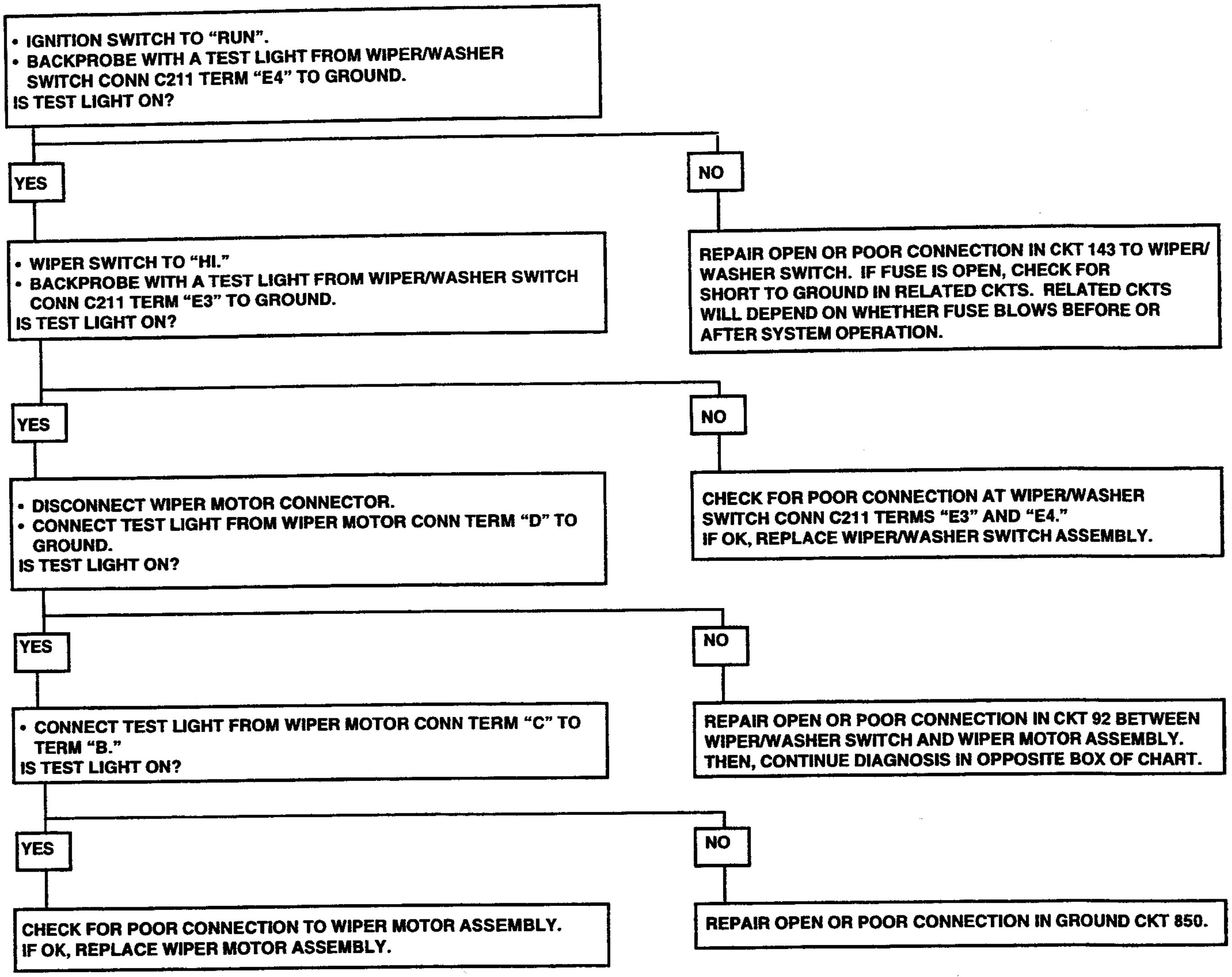
Figure 4 — Wiper/Washer System Check

SYMPTOM	PROCEDURE	PAGE
Wipers do not operate in any mode.	Chart 1	8E-5
Wipers run when switch is in "OFF" position.	Chart 2	8E-6
No low-speed mode (delay OK).	Replace wiper/washer switch assembly.	—
No high-speed mode.	Chart 3	8E-6
Wipers operate only when switch is in "HI" position, but run at low speed.	Check for open or poor connection in CKT 143 between I/P fuse block TERM "L3" and wiper motor CONN C211 TERM "C." If OK, replace wiper motor assembly.	—
Low-speed, pulse delay, and mist modes inoperative (high-speed mode OK).	Chart 4	8E-7
Pulse delay operates incorrectly or not at all.	Chart 5	8E-7
Wipers stop randomly and do not park when switch is moved to "OFF" position.	Chart 6	8E-8
Wipers do not operate when washer switch is activated.	Chart 7	8E-9
Washer does not operate.	Chart 8	8E-9

Figure 5 — Symptom Table

PROCEDURE 1

WIPERS DO NOT OPERATE IN ANY MODE



- IGNITION SWITCH TO "RUN".
- BACKPROBE WITH A TEST LIGHT FROM WIPER/WASHER SWITCH CONN C211 TERM "E4" TO GROUND.

IS TEST LIGHT ON?

YES

- WIPER SWITCH TO "HI."
- BACKPROBE WITH A TEST LIGHT FROM WIPER/WASHER SWITCH CONN C211 TERM "E3" TO GROUND.

IS TEST LIGHT ON?

NO

REPAIR OPEN OR POOR CONNECTION IN CKT 143 TO WIPER/WASHER SWITCH. IF FUSE IS OPEN, CHECK FOR SHORT TO GROUND IN RELATED CKTS. RELATED CKTS WILL DEPEND ON WHETHER FUSE BLOWS BEFORE OR AFTER SYSTEM OPERATION.

YES

- DISCONNECT WIPER MOTOR CONNECTOR.
- CONNECT TEST LIGHT FROM WIPER MOTOR CONN TERM "D" TO GROUND.

IS TEST LIGHT ON?

NO

CHECK FOR POOR CONNECTION AT WIPER/WASHER SWITCH CONN C211 TERMS "E3" AND "E4."
IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.

YES

- CONNECT TEST LIGHT FROM WIPER MOTOR CONN TERM "C" TO TERM "B."

IS TEST LIGHT ON?

NO

REPAIR OPEN OR POOR CONNECTION IN CKT 92 BETWEEN WIPER/WASHER SWITCH AND WIPER MOTOR ASSEMBLY. THEN, CONTINUE DIAGNOSIS IN OPPOSITE BOX OF CHART.

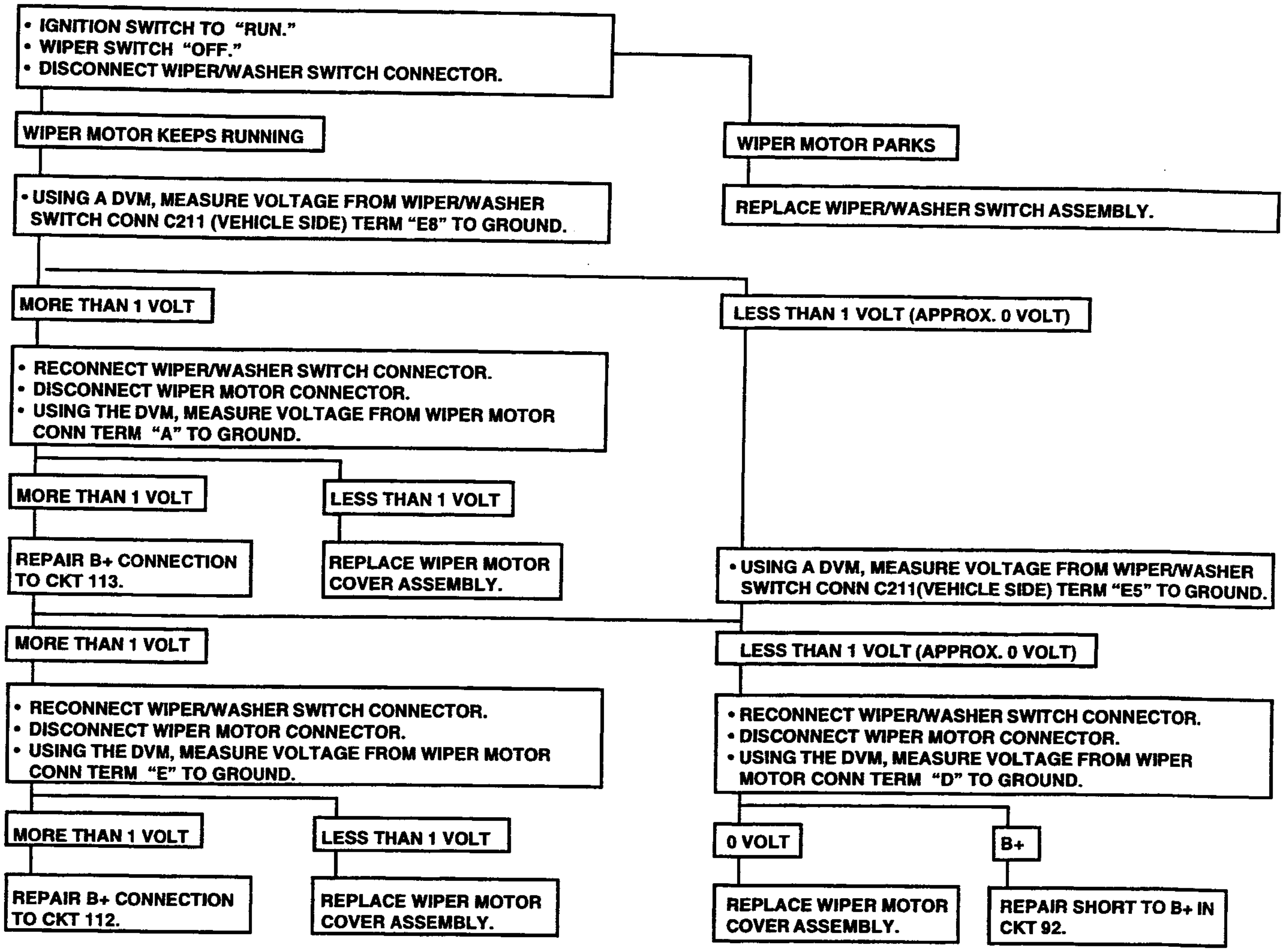
YES

CHECK FOR POOR CONNECTION TO WIPER MOTOR ASSEMBLY.
IF OK, REPLACE WIPER MOTOR ASSEMBLY.

NO

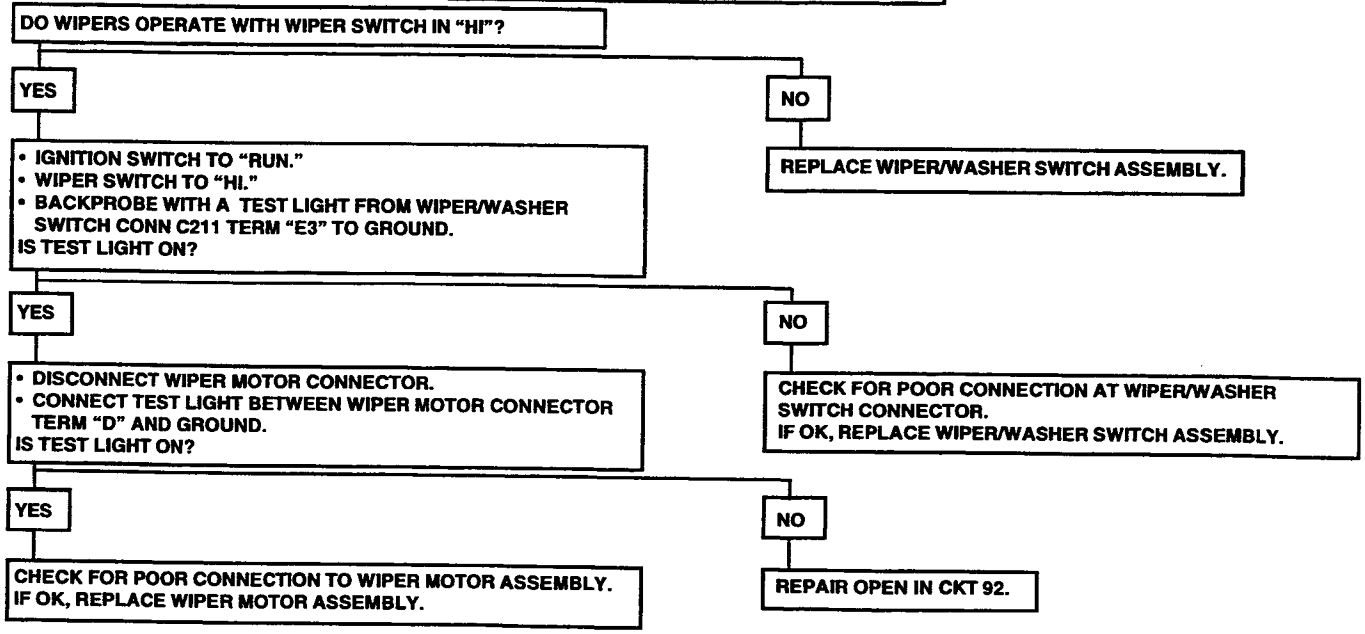
REPAIR OPEN OR POOR CONNECTION IN GROUND CKT 850.

PROCEDURE 2
WIPERS RUN WHEN SWITCH IS IN "OFF" POSITION



- IGNITION SWITCH TO "RUN."
- WIPER SWITCH "OFF."
- DISCONNECT WIPER/WASHER SWITCH CONNECTOR.
  - WIPER MOTOR KEEPS RUNNING
    - USING A DVM, MEASURE VOLTAGE FROM WIPER/WASHER SWITCH CONN C211 (VEHICLE SIDE) TERM "E8" TO GROUND.
      - MORE THAN 1 VOLT
        - RECONNECT WIPER/WASHER SWITCH CONNECTOR.
        - DISCONNECT WIPER MOTOR CONNECTOR.
        - USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "A" TO GROUND.
          - MORE THAN 1 VOLT
            - REPAIR B+ CONNECTION TO CKT 113.
          - LESS THAN 1 VOLT
            - REPLACE WIPER MOTOR COVER ASSEMBLY.
      - LESS THAN 1 VOLT (APPROX. 0 VOLT)
        - USING A DVM, MEASURE VOLTAGE FROM WIPER/WASHER SWITCH CONN C211(VEHICLE SIDE) TERM "E5" TO GROUND.
          - MORE THAN 1 VOLT
            - RECONNECT WIPER/WASHER SWITCH CONNECTOR.
            - DISCONNECT WIPER MOTOR CONNECTOR.
            - USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "E" TO GROUND.
              - MORE THAN 1 VOLT
                - REPAIR B+ CONNECTION TO CKT 112.
              - LESS THAN 1 VOLT
                - REPLACE WIPER MOTOR COVER ASSEMBLY.
          - LESS THAN 1 VOLT (APPROX. 0 VOLT)
            - RECONNECT WIPER/WASHER SWITCH CONNECTOR.
            - DISCONNECT WIPER MOTOR CONNECTOR.
            - USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "D" TO GROUND.
              - 0 VOLT
                - REPLACE WIPER MOTOR COVER ASSEMBLY.
              - B+
                - REPAIR SHORT TO B+ IN CKT 92.
  - WIPER MOTOR PARKS
    - REPLACE WIPER/WASHER SWITCH ASSEMBLY.

PROCEDURE 3
NO HIGH-SPEED MODE



- DO WIPERS OPERATE WITH WIPER SWITCH IN "HI"?
  - YES
    - IGNITION SWITCH TO "RUN."
    - WIPER SWITCH TO "HI."
    - BACKPROBE WITH A TEST LIGHT FROM WIPER/WASHER SWITCH CONN C211 TERM "E3" TO GROUND.
    - IS TEST LIGHT ON?
      - YES
        - DISCONNECT WIPER MOTOR CONNECTOR.
        - CONNECT TEST LIGHT BETWEEN WIPER MOTOR CONNECTOR TERM "D" AND GROUND.
        - IS TEST LIGHT ON?
          - YES
            - CHECK FOR POOR CONNECTION TO WIPER MOTOR ASSEMBLY. IF OK, REPLACE WIPER MOTOR ASSEMBLY.
          - NO
            - REPAIR OPEN IN CKT 92.
      - NO
        - CHECK FOR POOR CONNECTION AT WIPER/WASHER SWITCH CONNECTOR. IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.
  - NO
    - REPLACE WIPER/WASHER SWITCH ASSEMBLY.

PROCEDURE 4

LOW-SPEED, PULSE DELAY, AND MIST MODES INOPERATIVE (HIGH-SPEED MODE OK)

- IGNITION SWITCH TO "RUN."
- WIPER SWITCH TO "LO."
- USING A DVM, MEASURE VOLTAGE BY BACKPROBING FROM WIPER/WASHER SWITCH CONN C211 TERM "E8" TO GROUND.

MORE THAN 1 VOLT

- USING A DVM, MEASURE VOLTAGE BY BACKPROBING FROM WIPER/WASHER SWITCH CONN C211 TERM "E5" TO GROUND.

    MORE THAN 1 VOLT

    - DISCONNECT WIPER MOTOR CONNECTOR.
    - USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "A" TO GROUND.

        MORE THAN 1 VOLT

        - USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "E" TO GROUND.

            MORE THAN 1 VOLT

            REPLACE WIPER MOTOR COVER ASSEMBLY.

            LESS THAN 1 VOLT (APPROX. 0 VOLT)

            REPAIR OPEN IN CKT 112.

        LESS THAN 1 VOLT (APPROX. 0 VOLT)

        REPAIR OPEN IN CKT 113.

    LESS THAN 1 VOLT (APPROX. 0 VOLT)

    CHECK FOR POOR CONNECTION AT WIPER/WASHER SWITCH CONNECTOR.
    IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.

LESS THAN 1 VOLT (APPROX. 0 VOLT)

CHECK FOR POOR CONNECTION AT WIPER/WASHER SWITCH CONNECTOR.
IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.

PROCEDURE 5

PULSE DELAY OPERATES INCORRECTLY OR NOT AT ALL

- IGNITION SWITCH "OFF."
- DISCONNECT WIPER/WASHER SWITCH CONNECTOR.
- WIPER SWITCH TO "DELAY."
- WITH A DIGITAL MULTIMETER SET TO OHMS SCALE, MEASURE RESISTANCE THROUGH WIPER/WASHER SWITCH ASSEMBLY FROM SWITCH CONN C211 TERM "E4" TO TERM "E5."
- MOVE WIPER SWITCH THROUGH ENTIRE DELAY RANGE, ONE NOTCH AT A TIME.

DOES RESISTANCE VARY FROM APPROXIMATELY 39 KΩ TO 680 KΩ (SEE FIGURE 1)?

YES

- RECONNECT WIPER/WASHER SWITCH CONNECTOR.
- DISCONNECT WIPER MOTOR CONNECTOR.
- IGNITION SWITCH TO "RUN."
- USING A DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "E" TO GROUND.

    B+

    REPLACE WIPER MOTOR COVER ASSEMBLY.

    APPROX. 0 VOLT

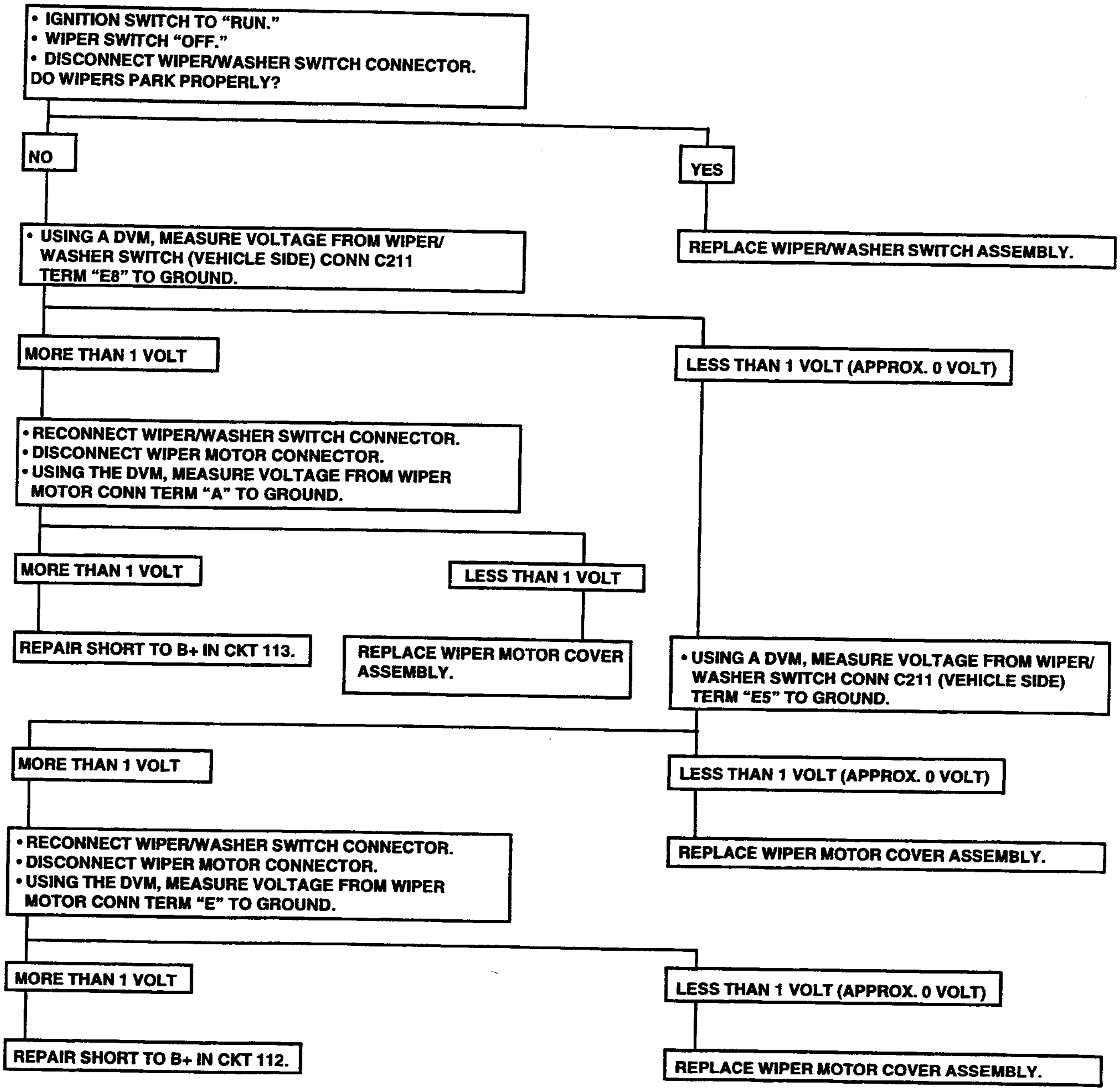
    CHECK CKT 112 FOR OPEN OR POOR CONNECTION.
    IF OK, REPLACE WIPER MOTOR ASSEMBLY.

NO

REPLACE WIPER/WASHER SWITCH ASSEMBLY.

PROCEDURE 6

WIPERS STOP RANDOMLY AND DO NOT PARK WHEN SWITCH IS MOVED TO "OFF" POSITION


• IGNITION SWITCH TO "RUN."
• WIPER SWITCH "OFF."
• DISCONNECT WIPER/WASHER SWITCH CONNECTOR.
DO WIPERS PARK PROPERLY?
NO
YES
REPLACE WIPER/WASHER SWITCH ASSEMBLY.
• USING A DVM, MEASURE VOLTAGE FROM WIPER/WASHER SWITCH (VEHICLE SIDE) CONN C211 TERM "E8" TO GROUND.
MORE THAN 1 VOLT
LESS THAN 1 VOLT (APPROX. 0 VOLT)
• RECONNECT WIPER/WASHER SWITCH CONNECTOR.
• DISCONNECT WIPER MOTOR CONNECTOR.
• USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "A" TO GROUND.
MORE THAN 1 VOLT
LESS THAN 1 VOLT
REPAIR SHORT TO B+ IN CKT 113.
REPLACE WIPER MOTOR COVER ASSEMBLY.
• USING A DVM, MEASURE VOLTAGE FROM WIPER/WASHER SWITCH CONN C211 (VEHICLE SIDE) TERM "E5" TO GROUND.
MORE THAN 1 VOLT
LESS THAN 1 VOLT (APPROX. 0 VOLT)
• RECONNECT WIPER/WASHER SWITCH CONNECTOR.
• DISCONNECT WIPER MOTOR CONNECTOR.
• USING THE DVM, MEASURE VOLTAGE FROM WIPER MOTOR CONN TERM "E" TO GROUND.
REPLACE WIPER MOTOR COVER ASSEMBLY.
MORE THAN 1 VOLT
LESS THAN 1 VOLT (APPROX. 0 VOLT)
REPAIR SHORT TO B+ IN CKT 112.
REPLACE WIPER MOTOR COVER ASSEMBLY.

PROCEDURE 7

WIPERS DO NOT OPERATE WHEN WASHER SWITCH IS ACTIVATED (ALL OTHER MODES OK)

- IGNITION SWITCH TO "RUN."
- DISCONNECT WIPER MOTOR CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN WIPER/MOTOR CONNECTOR TERM "A" AND GROUND.
- ACTIVATE WASHER SWITCH AND OBSERVE TEST LIGHT.

IS TEST LIGHT ON?

NO

CHECK FOR OPEN IN CKT 113 OR FOR POOR CONNECTION AT WIPER/WASHER SWITCH OR AT WIPER MOTOR ASSEMBLY.
IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.

YES

REPLACE WIPER MOTOR COVER ASSEMBLY.

PROCEDURE 8

WASHER DOES NOT OPERATE

- DISCONNECT WASHER PUMP CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN TERMINALS "A" AND "B" OF PUMP CONNECTOR.
- ACTIVATE WASHER SWITCH.

IS TEST LIGHT ON?

YES

CHECK FOR POOR CONNECTION TO WASHER PUMP.
IF OK, REPLACE WASHER PUMP.

NO

- CONNECT THE TEST LIGHT BETWEEN WASHER PUMP CONN TERM "A" AND A GOOD GROUND.
- ACTIVATE WASHER SWITCH.

IS TEST LIGHT ON?

YES

REPAIR OPEN IN CKT 350.

NO

- BACKPROBE WITH A TEST LIGHT FROM WIPER/WASHER SWITCH CONN C211 TERM "E9" TO GROUND.
- ACTIVATE WASHER SWITCH.

IS TEST LIGHT ON?

YES

CHECK FOR OPEN IN CKT 228.

NO

CHECK FOR POOR CONNECTION AT WIPER/WASHER SWITCH CONN C211 TERM "E9."
IF OK, REPLACE WIPER/WASHER SWITCH ASSEMBLY.

DIAGNOSIS OF THE WIPER/WASHER SYSTEM

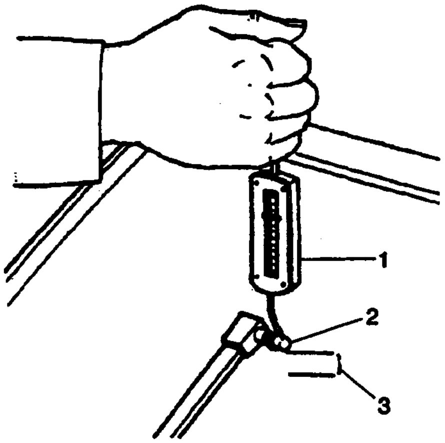
WIPER ARM CHATTER

If the wipers chatter or shudder when wiping the windshield, the windshield and/or inserts may need cleaning. Use a nonabrasive cleaner such as Bon Ami® to clean the windshield. Continue cleaning until water sheets off the windshield. Use undiluted windshield wiper/washer solvent and a clean, lint-free cloth to clean wiper inserts.

CAUTION: Avoid prolonged skin contact with washer solvent to avoid damage to your skin. Overexposure may cause central nervous system effects.

When marking the windshield for inside rear view mirror replacement or any other purpose, use only a water-soluble marker to make marks on the windshield. Other types of markers may damage the wiper inserts. The chemicals that are used to remove other types of markers may damage the paint, glass, inserts, or leave a residue on the glass that could lead to chatter.

Wiper arms must not be subjected to temperatures above 70°C (160°F). Remove wiper arms before any painting operations that include the use of an oven to cure the paint.



1. SCALE, TENSION
2. WIPER BLADE ATTACHING PIN
3. LIFT ARM APPROXIMATELY 1/2 INCH ABOVE GLASS

NOTE: BLADE SHOULD BE IN THE MIDDLE OF THE STROKE
TIP PRESSURE = 7.8 TO 9.5 NEWTONS
(28 TO 34 OUNCES)

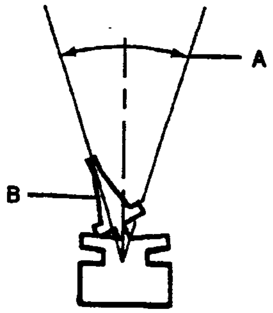
Figure 4—Checking Wiper Arm Pressure

CHECKING WIPER ARM PRESSURE

If the wipers miss or shudder when wiping the windshield, and the windshield and wiper inserts have been cleaned, the wiper arm pressure should be checked. Refer to Figure 4. If the wiper arms are not within the specifications given in Figure 4, replace them. Refer to "Wiper Arm Assembly Replacement."

BLADE INSERT SET CHECK

Remove the wiper blade assemblies from the wiper arms. Look down the length of the blade insert (Figure 5). The rubber insert that contacts the glass must be on the center line of the blade assembly ±15 degrees. Replace the insert if necessary.



A. BLADE ELEMENT SHOULD NOT BE BENT MORE THAN 15° IN EITHER DIRECTION FROM CENTER LINE.
B. ELEMENT, BLADE

Figure 5—Blade Insert Set Check

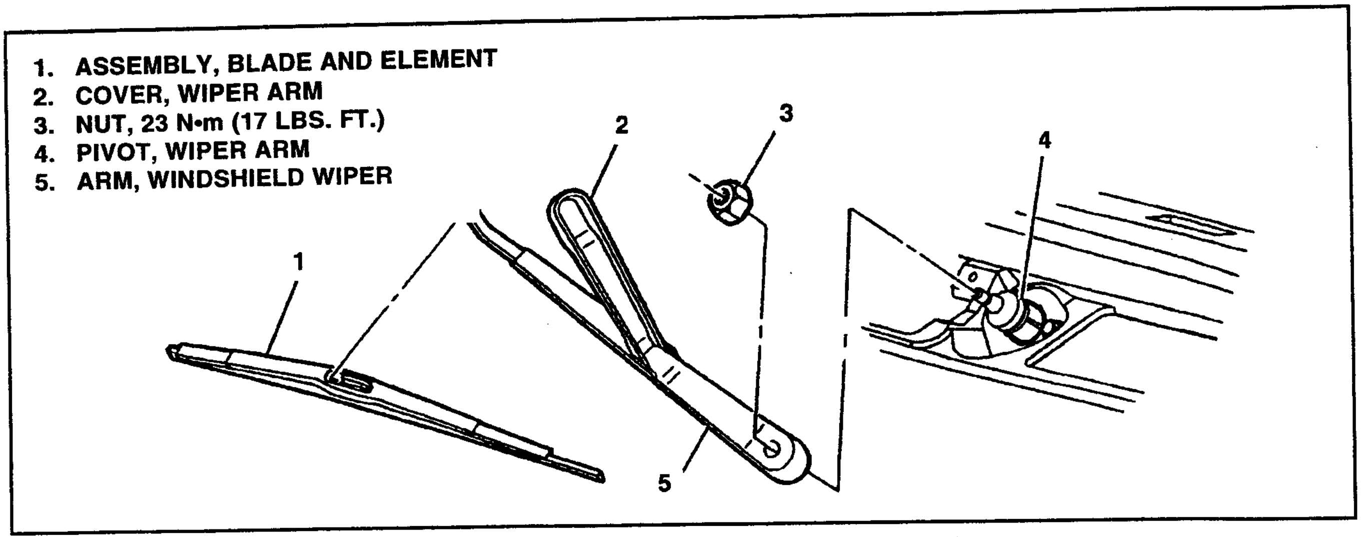

1. ASSEMBLY, BLADE AND ELEMENT
2. COVER, WIPER ARM
3. NUT, 23 N•m (17 LBS. FT.)
4. PIVOT, WIPER ARM
5. ARM, WINDSHIELD WIPER
1
2
3
4
5

Figure 6 — Wiper Arm Assembly Replacement

ON-VEHICLE SERVICE

WIPER ARM ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 7)

- Mark the wiper park position on the windshield with a suitable non-permanent marker.

1. Cover from wiper arm assembly.
2. Arm assembly retaining nut.
3. Wiper arm assembly from the vehicle.

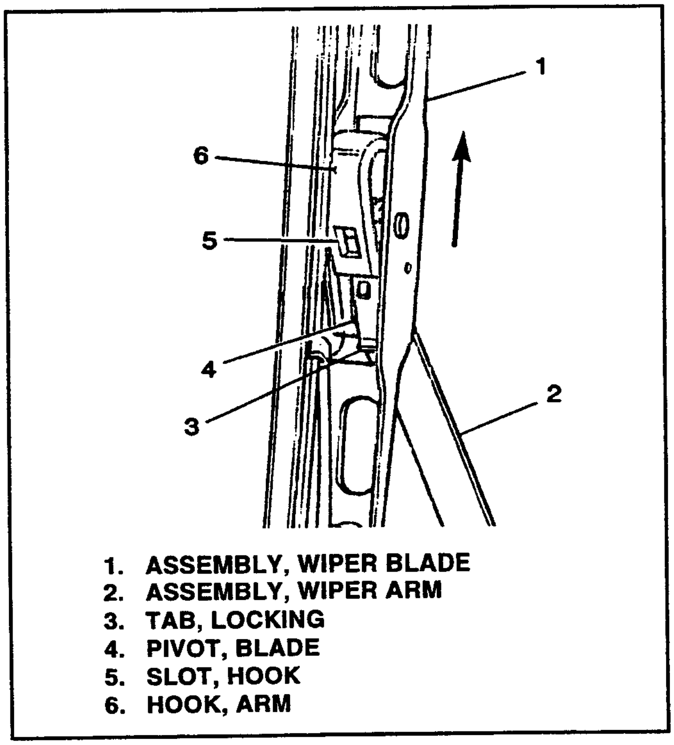

1
2
3
4
5
6
1. ASSEMBLY, WIPER BLADE
2. ASSEMBLY, WIPER ARM
3. TAB, LOCKING
4. PIVOT, BLADE
5. SLOT, HOOK
6. HOOK, ARM

Figure 7 — Blade Assembly Replacement

Install or Connect (Figure 7)

NOTICE: Refer to the Fastener Notice in the GENERAL INFORMATION SECTION.

1. Wiper arm assembly and retaining nut to the vehicle.

   Tighten

   - Wiper arm retaining nut to 23 N•m (17 lbs. ft.)

2. Wiper arm assembly cover.

Inspect

- Perform System Check.

WIPER BLADE ASSEMBLY AND INSERT REPLACEMENT

Remove or Disconnect (Figures 7 and 8)

1. Lift the wiper arm until it locks into the vertical service-up position.

NOTICE: Use care when removing or installing a blade assembly. Inadvertent bumping can cause the arm to toggle back and strike the windshield.

2. Press down on the locking tab of the blade assembly pivot, then pull downward on the blade assembly to disengage it from the hook of the wiper arm (Figure 7).
3. Insert from the blade assembly.
   - The insert has two notches at one end that are locked by the bottom claws of the blade assembly. At the notched end, pull the insert from the blade assembly (Figure 8).

Install or Connect (Figures 8 and 9)

Important

- Replacement inserts have three plastic caps that retain the two metal flexor strips. Do not remove these caps before the insert is installed.

1. At end "A" of the blade assembly (Figure 9), slide the insert (notched end last) into the blade claws. The plastic caps will be forced off as the insert is fully inserted.
2. Be certain that the notches are locked by the bottom claws and that all other claws are properly engaged in the slots of the insert on both sides.
3. Position pivot of blade assembly into hook of the wiper arm and pull upward until the locking tab of the pivot engages the slot in the hook (Figure 7).
4. Carefully lower wiper arm and blade assembly onto the windshield.

Inspect

- Perform System Check.

CIRCUIT BOARD AND TERMINAL ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 10)

1. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.
2. Wiper motor electrical connector.
3. Screws.
4. Cover.
5. Circuit board and terminal assembly by lifting up on terminal.

Install or Connect (Figure 10)

1. Circuit board and terminal assembly.
2. Cover.

NOTICE: Refer to the Fastener Notice in the GENERAL INFORMATION SECTION.

3. Screws.

Tighten

- Circuit board and terminal assembly screws to 2.6 N•m (23 lbs. in.).

4. Wiper motor electrical connector.
5. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.

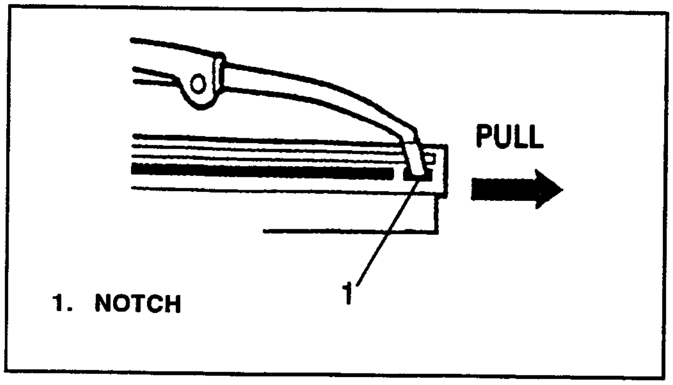


Figure 8 — Insert Removal

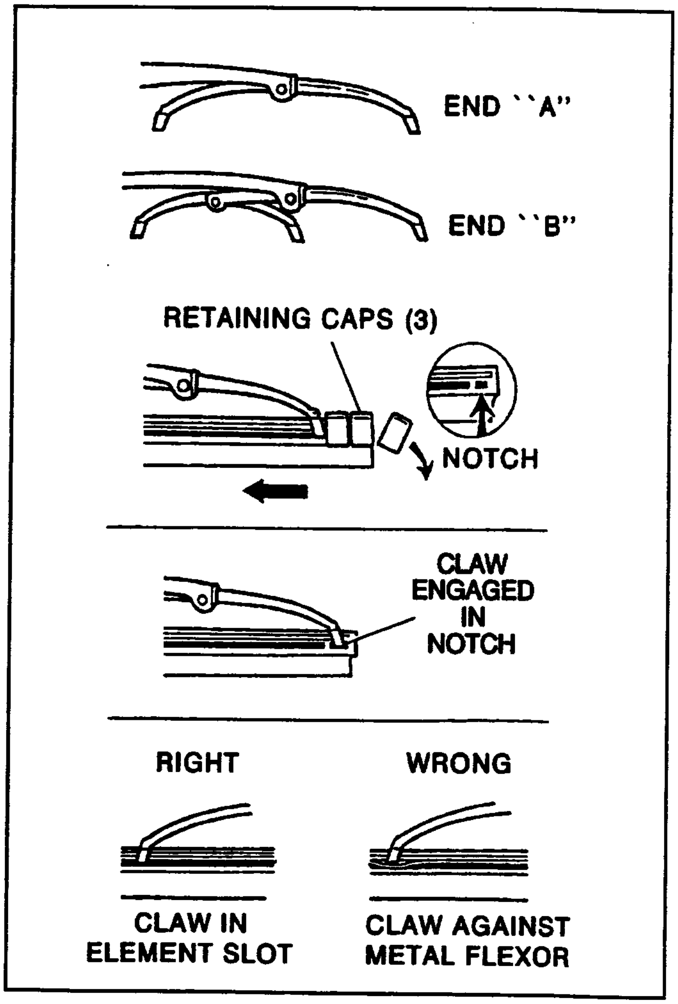


Figure 9 — Insert Installation

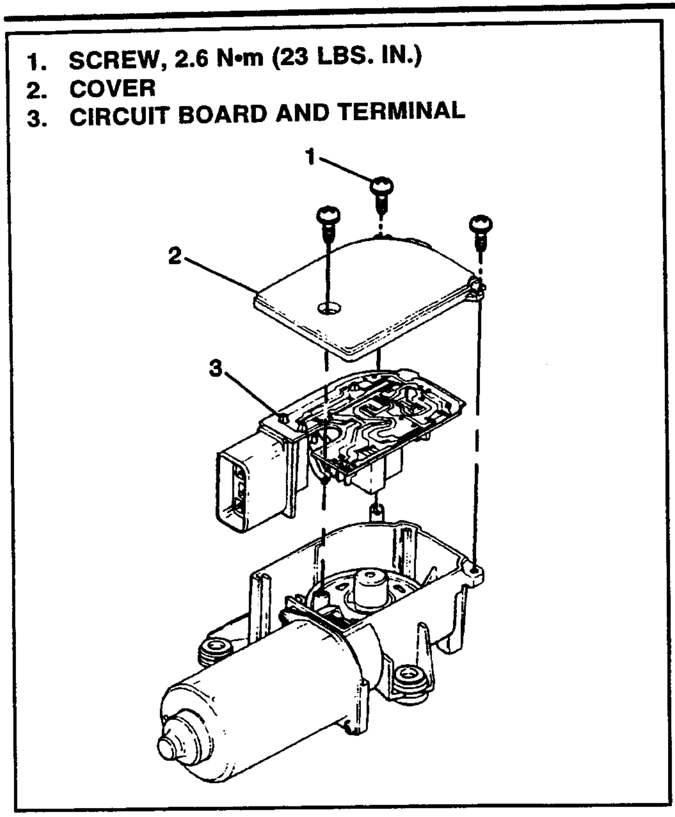

1. SCREW, 2.6 N•m (23 LBS. IN.)
2. COVER
3. CIRCUIT BOARD AND TERMINAL
1
2
3

Figure 10 — Circuit Board and Terminal Assembly Replacement

WIPER TRANSMISSION ASSEMBLY REPLACEMENT

Tools Required:
J 39232 Wiper Transmission Disassembly Tool
J 39529 Wiper Transmission Assembly Tool

Remove or Disconnect (Figures 11 and 12)

1. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.
2. Wiper arm assemblies. Refer to "Wiper Arm Assembly Replacement."
3. Cowl vent grille. Refer to the BODY SECTION.
4. Transmission screws.

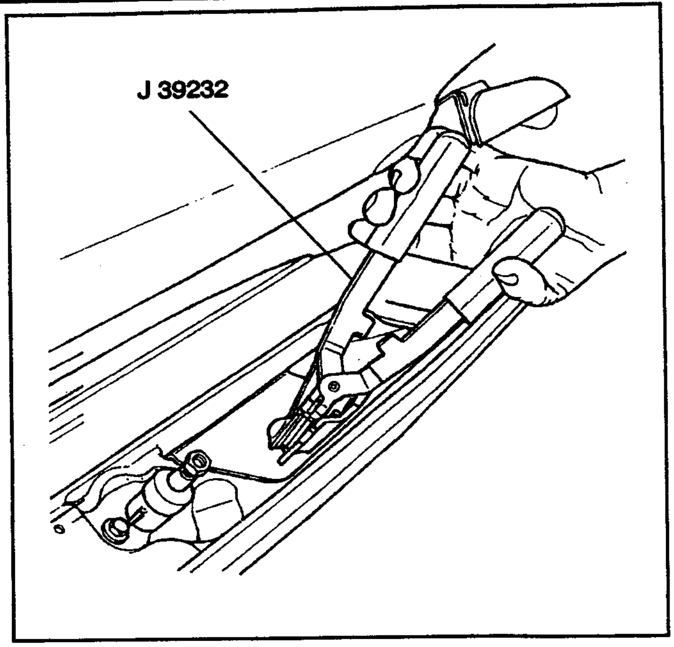


Figure 11 — Disassembling Wiper Transmission Using J 39232

5. Transmission assembly from the vehicle.
   - Unseat the transmission assembly from the wiper motor crank arm using J39232 (Figure 11), and remove it through the access openings in the top of the cowl.

Install or Connect (Figures 12 and 13)

1. Transmission assembly to the vehicle (Figure 12).

NOTICE: Refer to the Fastener Notice in the GENERAL INFORMATION SECTION.

2. Transmission screws.

Tighten

- Wiper transmission assembly mounting screws to 14 N•m (10 lbs. ft.).

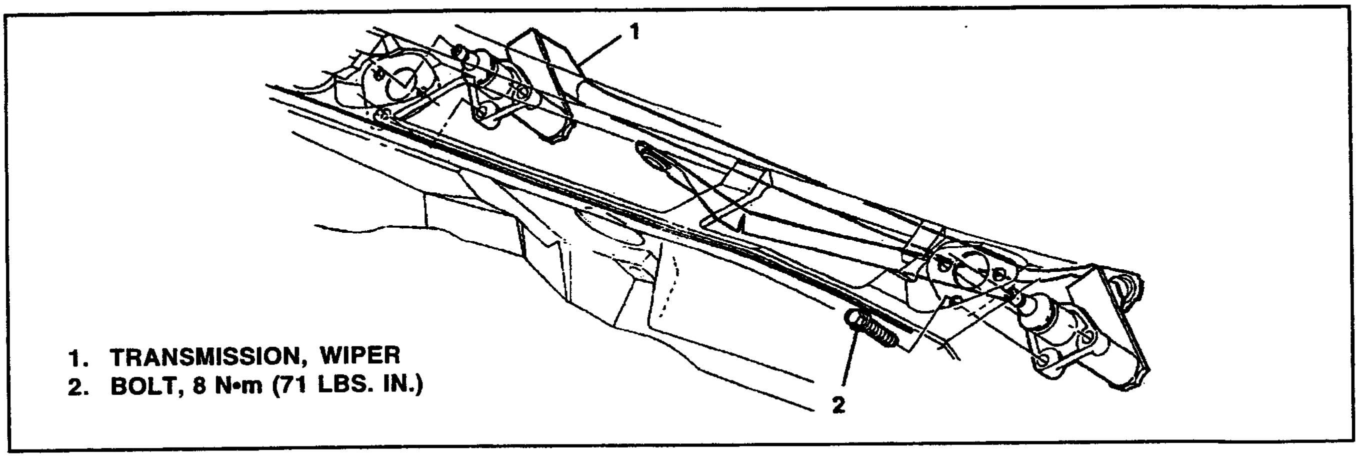


Figure 12 — Wiper Transmission Assembly Replacement

3. Transmission drive link to wiper motor crank arm using J 39529 (Figure 14).
   - Lubricate the inside of the socket with white lithium grease (GM P/N 9985885) or equivalent.

Important

- Wiper transmission assembly must be assembled to the crank arm past the second detent so the seal is compressed to a maximum height of 25 mm (1 inch).

4. Cowl vent grille. Refer to the BODY SECTION.
5. Wiper arm assemblies. Refer to "Wiper Arm Assembly Replacement."
6. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.

Inspect

- Perform System Check.

WIPER MOTOR ASSEMBLY REPLACEMENT

Remove or Disconnect (Figures 12 and 14)

1. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.
2. Wiper arm and blade assemblies. Refer to "Wiper Arm Replacement."
3. Cowl vent grille and screen. Refer to the BODY SECTION.
4. Electrical connector from wiper motor assembly.

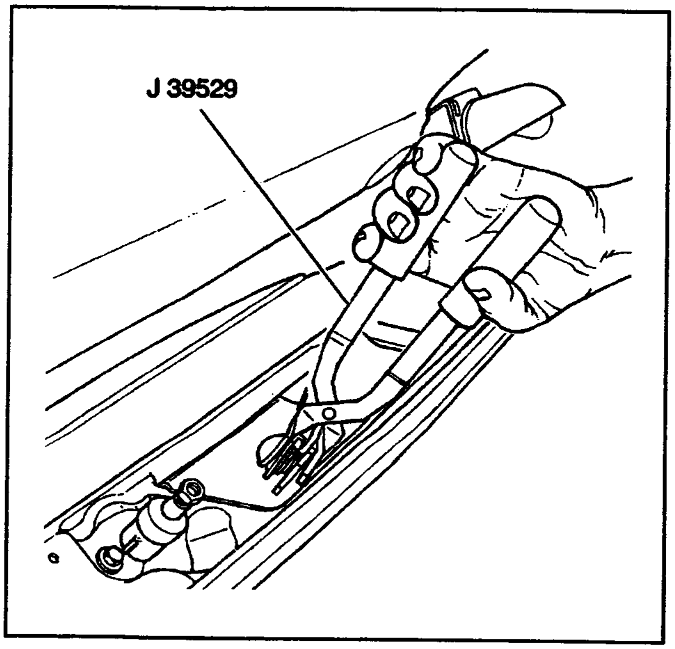


Figure 13—Assembling Wiper Transmission Using J 39529

5. Transmission from wiper motor drive link using J 39232 (Figure 12).
6. Wiper motor assembly from the vehicle.

Install or Connect (Figures 13 and 14)

NOTICE: For steps 1 and 2, refer to the Fastener Notice in the GENERAL INFORMATION SECTION.

1. Wiper motor assembly to the vehicle with three screws (Figure 14).

Tighten

- Wiper motor assembly mounting screws to 7 N•m (62 lbs. in.).

2. Drive link socket onto the crank arm ball of the wiper motor assembly using J 39529 (Figure 13).
   - Lubricate the inside of the socket with white lithium grease (GM P/N 9985885) or equivalent.

Important

- Wiper transmission assembly must be assembled to the crank arm past the second detent so the seal is compressed to a maximum height of 25 mm (1 inch).

3. Electrical connector.
4. Cowl vent screen and grille. Refer to the BODY SECTION.
5. Wiper arm and blade assemblies. Refer to "Wiper Arm Assembly Replacement."
6. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.

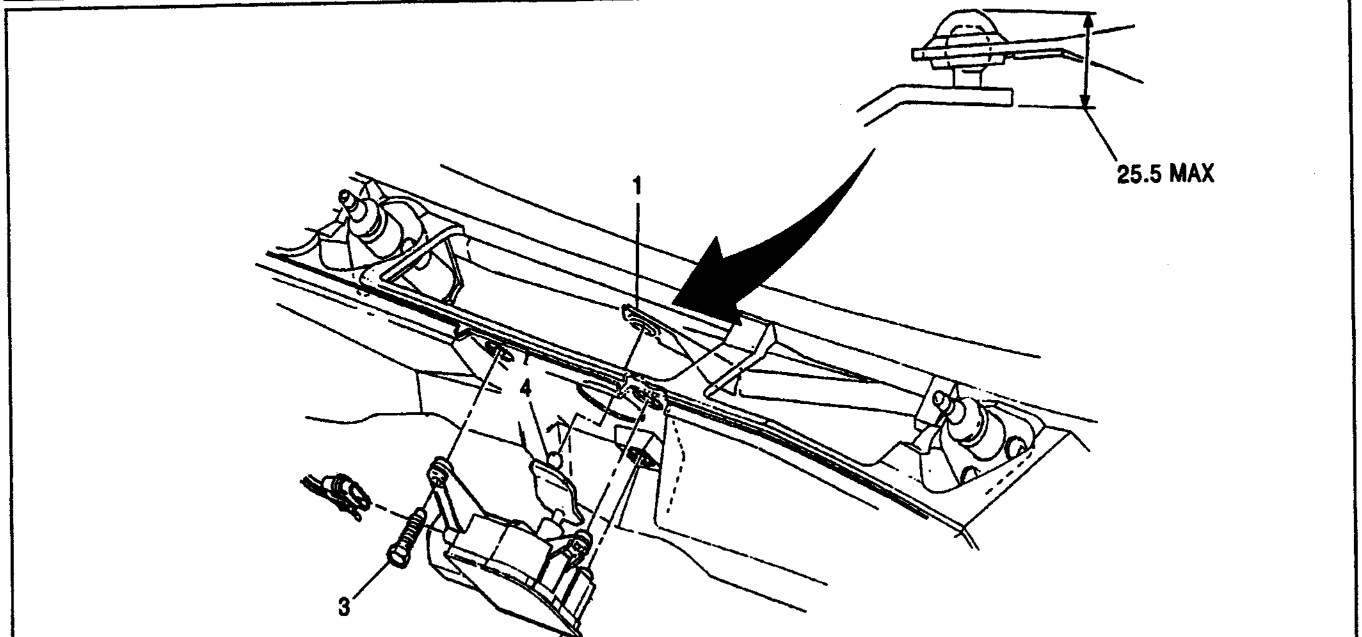
Inspect

- Perform System Check.

WIPER/WASHER SWITCH REPLACEMENT

The wiper/washer switch assembly is part of the steering column assembly. For replacement procedures without optional cruise control, refer to the CHASSIS/BODY ELECTRICAL SECTION.

The multifunction lever is part of the optional cruise control. For replacement procedures, refer to the STEERING COLUMNS SECTION.



1. TRANSMISSION, WIPER
2. MOTOR, WIPER
3. BOLT, 6.5 N•m (58 LBS. IN.)
4. ARM, CRANK

Figure 14 — Wiper Motor Assembly Replacement

WASHER SOLVENT CONTAINER AND PUMP REPLACEMENT

Remove or Disconnect (Figure 15)

1. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.
2. Heater coolant reservoir. Refer to the HVAC SECTION
3. Washer solvent.
4. Electrical connector and washer hose assembly from the washer pump.
5. Solvent container mounting screws.
6. Solvent container from the vehicle.
7. Washer pump from the container.

Install or Connect (Figure 15)

1. Washer pump to the container.
   - Make sure washer pump is pushed all the way into the container seal.
2. Solvent container to the vehicle by inserting legs into the inner fender holes.

NOTICE: Refer to the Fastener Notice in the GENERAL INFORMATION SECTION.

3. Solvent container screws.

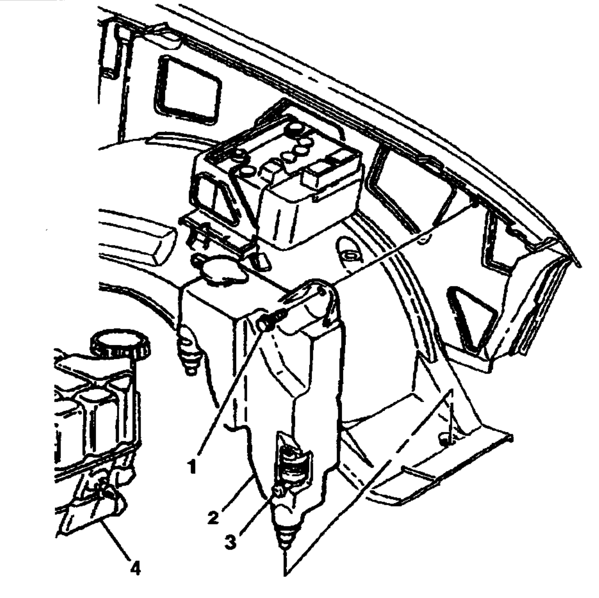
Tighten

- Solvent container mounting screws to 3 N•m (27 lbs. in.).

4. Electrical connector and washer hose assembly.
5. Washer solvent.
6. Heater coolant reservoir. Refer to the HVAC SECTION
7. Negative battery cable. Refer to the AUXILIARY BATTERY SECTION.

Inspect

- Perform System Check.



1. BOLT, 3 N.m (27 LBS. IN.)
2. RESERVOIR, WSW SOLVENT
3. MOTOR, WSW PUMP
4. RESERVOIR, HTR. COOLANT

Figure 15 — Washer Solvent Container and Pump Replacement

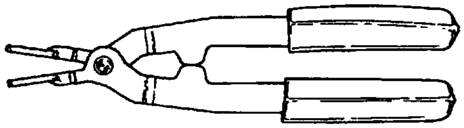
SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ITEM	N•m	Lbs. Ft.	Lbs. In.
Circuit Board and Terminal Assembly Screws	2.6	—	23
Drive Link Socket Nuts	7	—	62
Solvent Container Mounting Screw	3	—	27
Transmission Assembly Mounting Screws	14	10	—
Wiper Arm Retaining Nut	23	17	—
Wiper Motor Assembly Mounting Screws	7	—	62

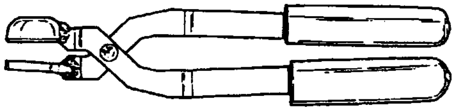
SPECIAL TOOLS

1.



J 39232

2.



J 39529

1. WIPER TRANSMISSION SEPARATOR
2. WIPER TRANSMISSION INSTALLER

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BLANK

SECTION 9A

AUDIO SYSTEMS

GENERAL DESCRIPTION

RADIO

The UM7 2000 series radios feature an Electronically Tuned Receiver (ETR), vacuum fluorescent display for radio frequency and digital clock display, and seek and scan tuning.

HANDLING ELECTROSTATIC DISCHARGE (ESD) SENSITIVE PARTS

Many solid state electrical components can be damaged by electrostatic discharge (ESD). Some will display a label, but many will not (Figure 1).

In order to avoid possibly damaging any components, observe the following:

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
   - Slide across the vehicle seat.
   - Sit down or get up.
   - Do any walking.
2. Do not touch exposed electric terminals on components with your finger or any tools. Remember, the connector that you are checking might be tied into a circuit that could be damaged by electrostatic discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or between the exposed terminals.

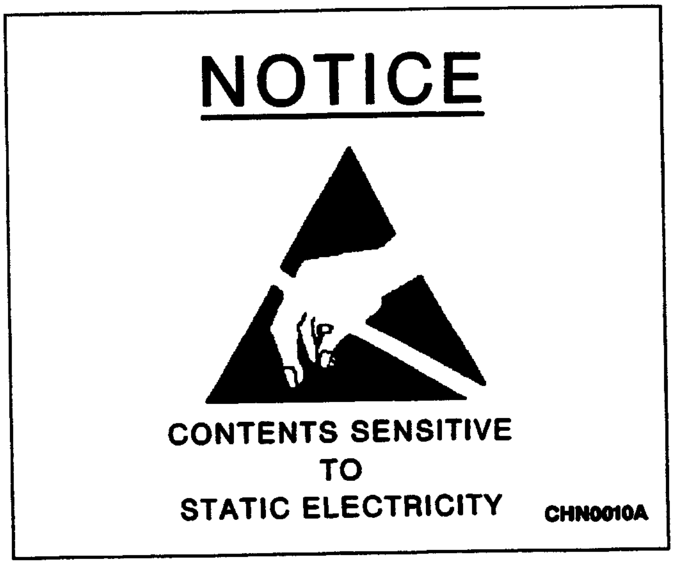

NOTICE
CONTENTS SENSITIVE TO STATIC ELECTRICITY
CHN0010A

Figure 1—Electrostatic Discharge Label

4. Never jumper, ground, or use test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install the part.
6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if:
   - They are bumped or dropped.
   - They are laid on any metal workbench or near a component that operates electrically, such as a TV, radio, or oscilloscope.

DESCRIPTION OF OPERATION

Upper Knob and Balance Control Ring

Turn the upper knob to turn the system on and off.

Turn the knob to the right to increase volume and to the left to decrease volume.

The control ring behind the knob is the balance control. Turn the ring to the right to move speaker balance to the right. Turn it to the left to move speaker balance to the left.

If the radio is off, pressing the upper knob will recall the time of day. When the ignition is off, pressing the upper knob will recall the time of day.

Recall

If the radio is on, pressing the upper knob will alternately cause the VF display to change from time of day to radio frequency display.

Lower Knob and Fader Control Ring

Turn the lower knob to manually select radio stations. When the radio is on press the lower knob to choose between the AM or FM band.

The control ring behind the lower knob fades the sound between the front and rear speakers.

Set Button

The SET button has two functions. Use it in conjunction with the four radio station preset buttons to program radio frequencies into the memory locations. Its second function is to set the clock display. Refer to "Clock" in this section for detailed instructions on setting the time of day display. Refer to "Radio Frequency Preset Buttons" in this section for instructions on presetting AM and FM radio stations.

Bass and Treble Controls

Slide the TREBLE control up to increase or down to decrease treble. Slide the BASS control up to increase or down to decrease bass.

Radio Frequency Preset Buttons

To preset four desired AM stations and four FM stations:

1. Select AM or FM, and tune in the desired station.
2. Press SET button. The SET indicator will light.
3. Press a station button. The SET indicator will go out. The radio will then tune in the selected station whenever that button is pressed.

The 2000 series receivers with four station buttons have the ability to store up to seven AM and seven FM stations.

To preset three additional AM stations and three additional FM stations on some radios (Figures 2 through 4):

1. Tune in the desired station.
2. Press SET, and within 5 seconds press any two adjacent buttons at the same time.

The radio will now tune in the preselected station when the button, or button pair is pressed.

If electrical power is interrupted (by a blown fuse, discharged battery, etc.), the station(s) must be reset.

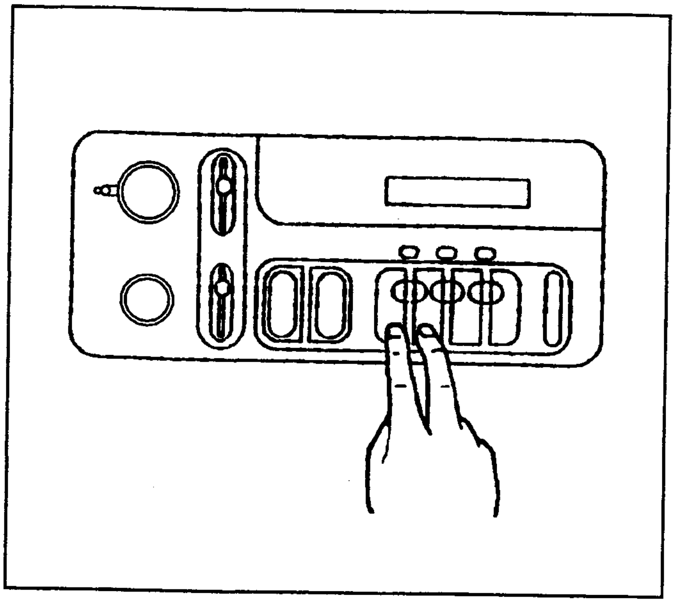


Figure 2—Pushbutton Pairing (Pair 1)

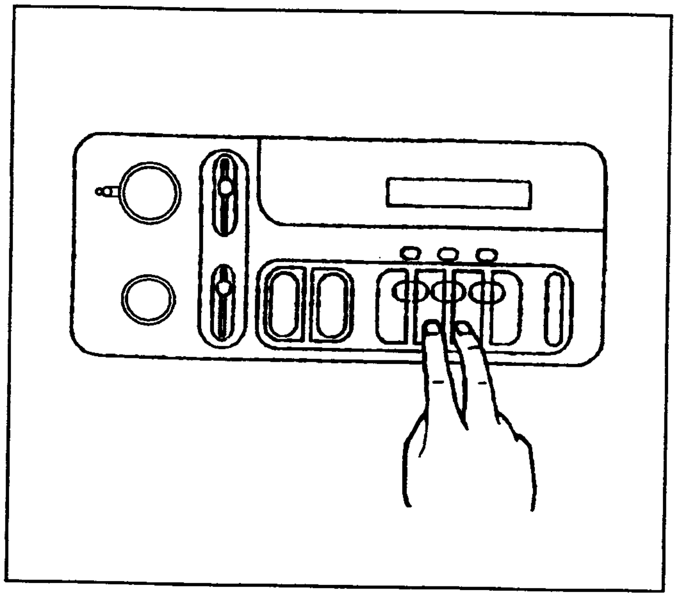


Figure 3—Pushbutton Pairing (Pair 2)

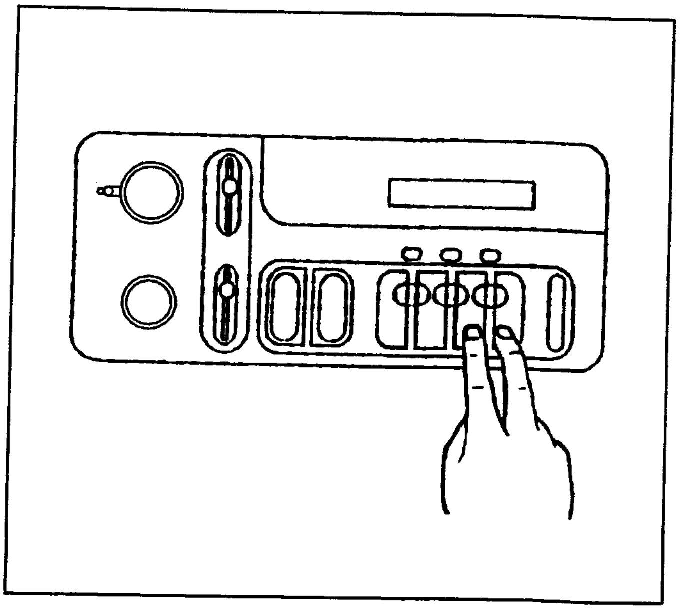


Figure 4—Pushbutton Pairing (Pair 3)

Frequency Band Ranges

The frequency band range for the 2000 series radio on the AM band is 530 Hz to 1710 Hz in 10 Hz increments.

The FM frequency band range is 87.7 Hz to 107.9 Hz in 200 Hz increments.

Clock

To set the clock display, the ignition lock cylinder must be in the ACCESSORY or RUN position. The radio may be on or off.

To set the HOUR portion of the clock display, press the SET button. Within 5 seconds, press the SCAN button and hold it in until the correct hour is displayed.

The MINUTE portion of the clock display is set by pressing the SET button and within 5 seconds, pressing the SEEK button and holding it in until the correct minute(s) are displayed. If the SET button is pressed while the radio is turned on, the radio frequency will be displayed. The time of day will display when the SEEK and SCAN buttons are pressed.

When the SET button is pressed, the SET indicator will appear on the display for approximately 5 seconds. If the SCAN or SEEK button is pressed after the SET button is pressed and before the SET indicator goes out, the SET indicator will stay on while the clock is being set and then will go out about 5 seconds after the SCAN or SEEK button has been released.

If electrical power is interrupted (by a blown fuse, discharged or disconnected battery, etc.), the clock must be reset after power is restored.

Seek and Scan (Radio)

The 2000 series radio system has the SEEK and SCAN feature for electronic station tuning.

If you press the SEEK button, the radio will tune into the next strong station that has a higher frequency than the previous station selection. When the SCAN button is pressed, the radio will move to the next strongest station of a higher frequency. It will pause there a few seconds, then scan to the next strongest station. The radio will continue scanning new stations until the

SCAN button is pressed again. When the radio reaches the upper end of the band, it will return to the low end and resume scanning.

Display Dimming

The receiver's Vacuum Fluorescent (VF) display has "step" dimming when the headlamps or parklamps are turned on. The display intensity is controlled by the position of the instrument panel lamp dimmer control.

When no voltage is present at the parklamp input to the radio (parklamps and headlamps off), the display will be at 100 percent intensity and cannot be dimmed by the instrument panel lamp dimmer control.

ON-VEHICLE SERVICE

RADIO

Remove or Disconnect (Figure 5)

1. Negative battery cable. Refer to Auxiliary Storage Battery.
2. Accessory trim plate. Refer to Interior Trim.
3. HVAC control assembly. Refer to Heater, Ventilation, and Air Conditioning.
4. Radio mounting screws.
5. Radio.
6. Radio nuts.
7. Instrument panel center compartment from radio.

Install or Connect (Figure 5)

1. Instrument panel center compartment to radio.
2. Radio nuts.

   Tighten

   - Radio nuts to 2.8 N.m (25 lb in).
3. Radio.
4. Radio mounting screws.

   Tighten

   - Radio mounting screws to 1.9 N.m (17 lb in).
5. HVAC control assembly. Refer to Heater, Ventilation, and Air Conditioning.
6. Accessory trim plate. Refer to Interior Trim.
7. Negative battery cable.
   - Check circuit operation.

SPEAKERS

Dash Mounted

Remove or Disconnect (Figure 6)

1. Radio front speaker grille screws.
2. Radio front speaker grille.
3. Radio front speaker screws.
4. Radio front speaker.
5. Electrical connector.

Install or Connect (Figure 6)

1. Electrical connector.
2. Radio front speaker.
3. Radio front speaker screws.

   Tighten

   - Radio front speaker screws to 1.9 N.m (17 lb in).
4. Radio front speaker grille.
5. Radio front speaker grille screws.

   Tighten

   - Radio front speaker grille screws to 1.9 N.m (17 lb in).
   - Check circuit operation.

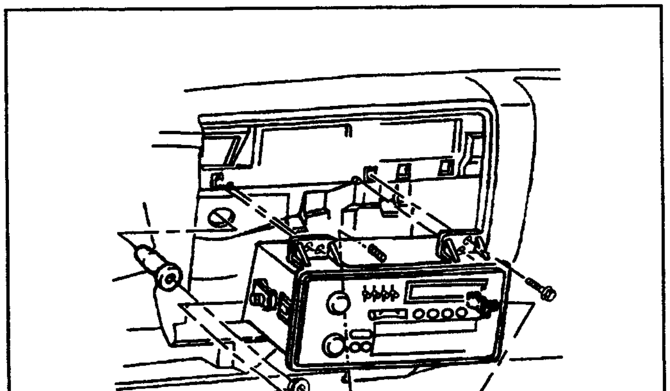


Figure 5—Radio Mounting

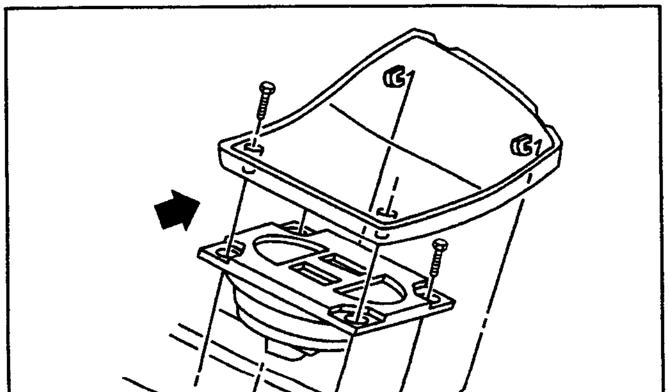


Figure 6—Radio Front Speaker

Door Mounted

↔ Remove or Disconnect (Figure 7)

1. Door trim panel. Refer to Door Trim Panel Replacement in Doors.
2. Rivets.
3. Radio front side door speaker.
4. Electrical connector.

→← Install or Connect (Figure 7)

1. Electrical connector.
2. Radio front side door speaker.
3. Rivets.
4. Door trim panel. Refer to Door Trim Panel Replacement in Doors.
   - Check circuit operation.

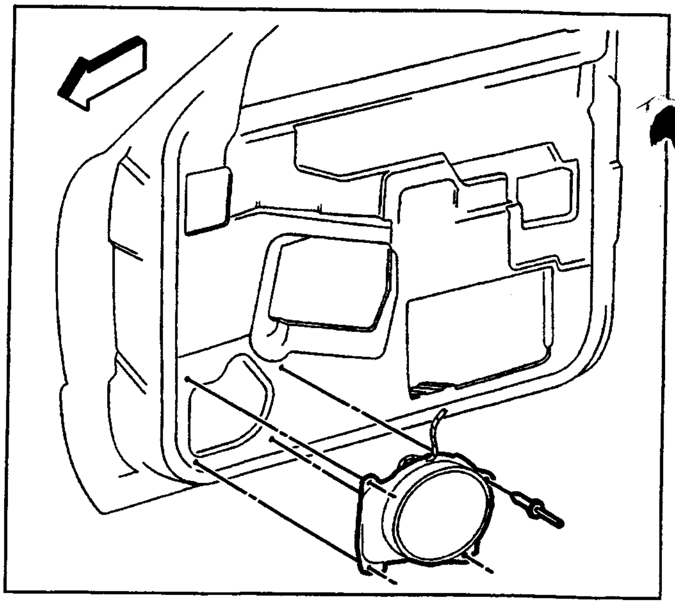


Figure 7—Front Side Door Speaker

ANTENNAS

GENERAL DESCRIPTION

The fixed mast barbless antenna is designed to withstand most car washes without damage. It cannot be adjusted up or down. If the mast becomes slightly bent, you can straighten it by hand. Replace the antenna if it becomes severely bent. Keep the antenna clean for good performance.

Poor grounding at the antenna mounting or any connection in the antenna/lead-in system can result in seriously reduced radio performance. A poor ground can be a reason for excess ignition noise on AM or erratic audio. Also, be sure lead-in connectors are free of dirt and corrosion and are tightly fastened.

Possible ground loss or high-resistance ground points are:

- Antenna upper mounting (loose screws, paint overspray, etc.).
- Lead-in cable connector at antenna (loose or internally corroded).
- Lead-in cable connector at radio (loose or internally corroded).
- Quick connect connector (corroded).
- Missing ground lead.

ANTENNA CABLE

↔ Remove or Disconnect (Figures 8 through 10)

1. Antenna mast.
2. Radio antenna cable from radio extension cable.
3. Fender. Refer to Fender Replacement in Sheet Metal and Fiberglass.
4. Radio antenna cable nut.
5. Radio antenna bezel.
6. Radio antenna cable screws.
7. Radio antenna cable.

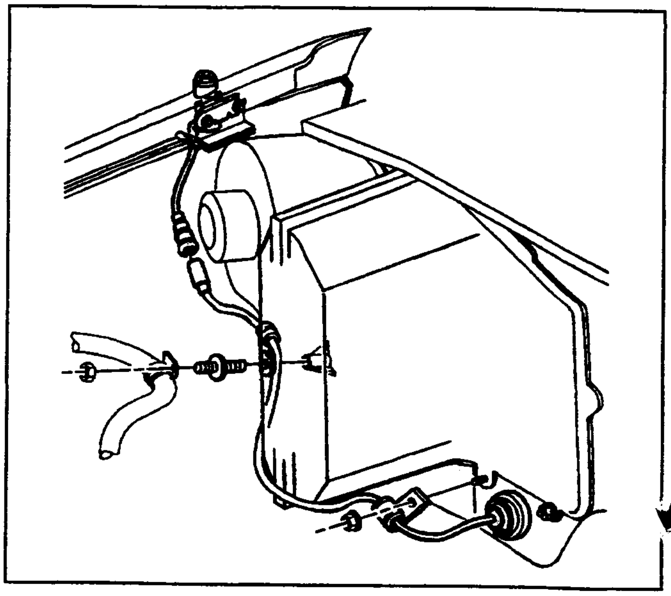


Figure 8—Antenna Cable Engine Compartment Routing

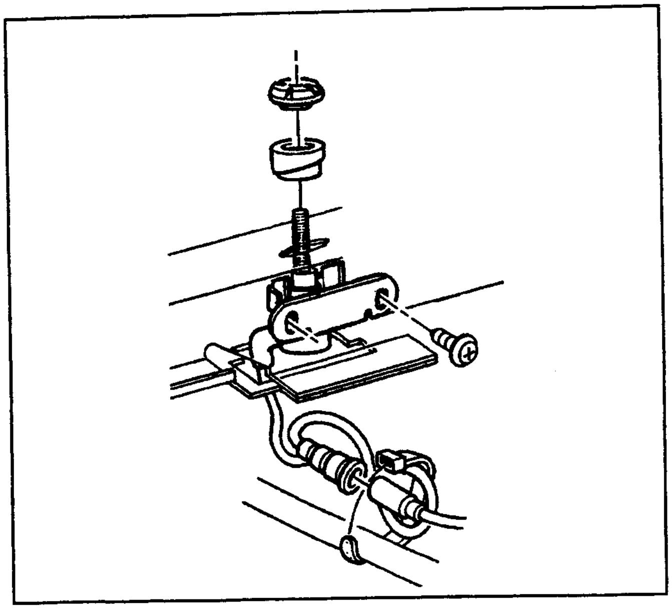


Figure 9—Antenna Cable at the Antenna Base

Install or Connect (Figures 8 through 10)

1. Radio antenna cable.
2. Radio antenna cable screws.

Tighten

- Radio antenna cable screws to 2.8 N·m (25 lb in).

3. Radio antenna bezel.
4. Radio antenna cable nut.
5. Fender.

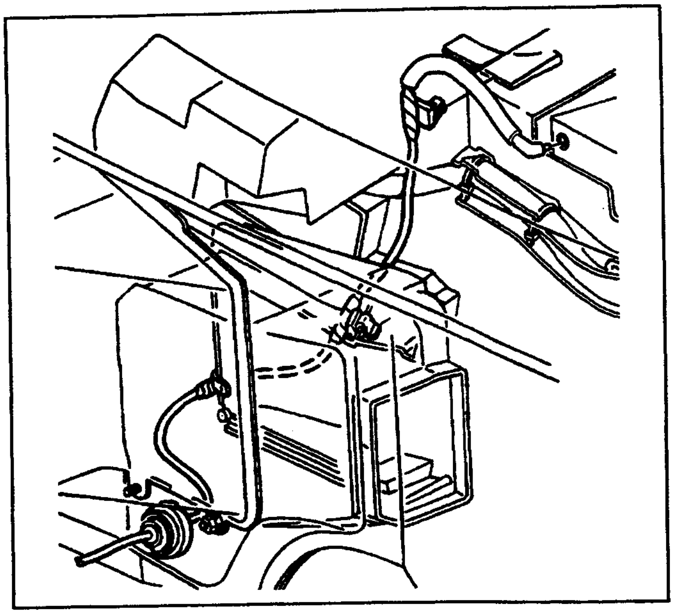


Figure 10—Antenna Cable Routing from Cowl to Radio

Tighten

- Radio antenna cable nut to 6 N·m (53 lb in).

6. Radio antenna cable to radio extension cable.
7. Antenna mast.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N·m	Lb Ft	Lb In
Radio Antenna Cable Mounting Screw	2.8	—	25
Radio Antenna Cable Nut	6	—	53
Radio Front Speaker Grille Mounting Screws	1.9	—	17
Radio Front Speaker Mounting Screws	1.9	—	17
Radio Mounting Nuts	2.8	—	25
Radio to Instrument Panel Mounting Screws	1.9	—	17

BLANK

SECTION 9B

CRUISE CONTROL

GENERAL DESCRIPTION

The cruise control system is totally electronic requiring no vacuum system to control throttle movement. The system maintains a desired vehicle speed of ± 2.0 km/h (1.0 mph) under normal driving conditions. The system also has the capability to coast, resume speed, accelerate, and increase or decrease speed in 1.6 km/h (1.0 mph) increments. The PCM contains a low speed lockout that prevents system engagement below a minimum speed of approximately 40 km/h (25 mph). During cruise control the accelerator remains in the minimum throttle position.

The main components of the system are the multifunction switch (Figure 1), Propulsion Control Module (PCM) located in the Power Inverter Module (PIM), the brake switch, and the motor speed sensor.

The PCM receives cruise signals from the multifunction switch and uses the propulsion control sensors to evaluate and command the cruise speed or to enable/disable the system. Speed information is fed directly into the PCM from the Motor Speed Sensor. The brake switch, which is usually closed, opens whenever the brake pedal is pressed signaling the PCM to disengage the cruise function.

CAUTION: To keep the vehicle under control and to prevent possible vehicle damage, do not use the cruise control on slippery roads. It is not recommended to use the cruise control in conditions such as on winding roads or in traffic of varying volume.

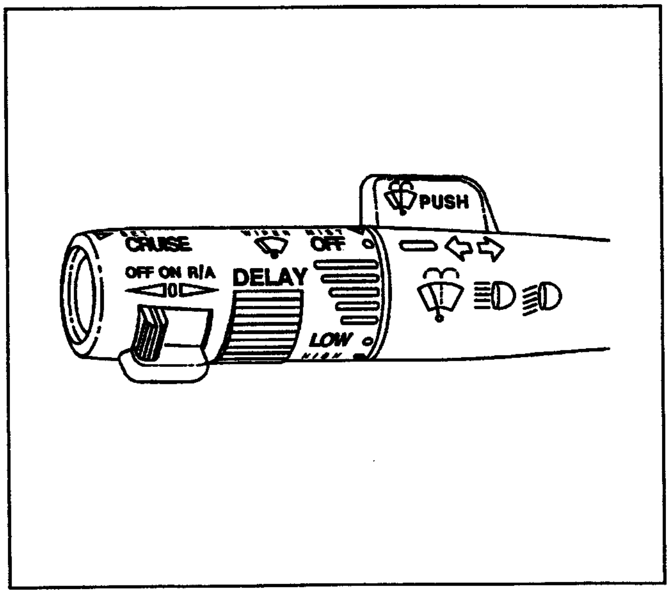


Figure 1—Multifunction Switch

MULTIFUNCTION SWITCH

OFF-ON-R/A Switch

The OFF-ON-R/A (Resume/Accelerate) slide switch, located on the multifunction switch, controls four functions:

- The OFF/ON function
- The resume function
- The accelerate function
- The tap-up function

The OFF/ON Function

When the OFF-ON-R/A switch is in the OFF position the system cannot be engaged. When the switch is in the ON position the system may be engaged at any speed above 40 km/h (25 mph) approximately.

The accelerator may be pressed at any time to override the cruise control system. Release of the accelerator will return the vehicle to the cruise speed previously set.

The Resume Function

If the cruise control system has been disengaged by pressing the brake pedal, it may be reactivated by momentarily sliding the OFF-ON-R/A switch to the R/A position. This will cause the vehicle to accelerate to the previously set speed and cruise at that speed. The resume function will not work if the OFF-ON-R/A switch has been moved to the OFF position or the ignition switch has been cycled since the last time the cruise control was active or the vehicle speed is below the low speed lockout of 40 km/h (25 mph).

The Accelerate Function

By sliding the OFF-ON-R/A switch to the R/A position and holding it, the vehicle will accelerate until the switch is released. The cruise control must be engaged and operating and the vehicle speed must be above the low speed lockout of 40 km/h (25 mph) for this function to operate.

The Tap-Up Function

For this function to operate, the cruise control must be engaged and operating. Slide the OFF-ON-R/A switch to the R/A position and immediately release it to tap-up, or tap the switch. Do not hold the switch in the R/A position or the system will revert to the accelerate mode. Tap-up is a function in which the cruise speed can be increased by 1.6 km/h (1 mph) increments (one tap = 1.6 km/h or 1 mph increase). The system cannot tap-up beyond the vehicle's maximum speed.

SET Switch

The cruise control SET button switch controls three functions:

- The set function
- The coast function
- The tap-down function

The Set Function

When the SET switch is pressed and then released with vehicle speed above the low speed lockout point and the OFF-ON-R/A switch in the ON position, the cruise speed will be set at the particular speed the vehicle was at when the switch was released. Cruise speed will be within ± 1.6 km/h (1 mph) of the actual speed when engaged. The system will cruise until either the OFF-ON-R/A switch is moved to the OFF position, the ignition switch is turned to the OFF position, and/or the SET switch is pressed and held. Pushing the brake or clutch pedal disengages the system, but the set speed is maintained in memory allowing the cruise speed to be resumed at a later time.

The Coast Function

When the SET switch is pressed, the vehicle speed can be raised or lowered. To increase cruise speed or accelerate to a new speed, press the SET switch, so that the PCM releases the previously set speed, then release the switch. Upon releasing the switch, a new speed is set. Set an increased cruise speed more easily with the ON-OFF-R/A switch as described above. To decrease cruise speed, press the SET switch to disengage the cruise control system, and allow the throttle to return to the idle position. When the vehicle has slowed to the desired lower cruise speed, release the switch to cause the system to cruise at the new speed.

The Tap-Down Function

For this function to operate, the cruise control must be engaged and operating. Press the SET switch and immediately release it, or tap the switch to tap-down. Do not hold the switch in the pressed position or the system will revert to the coast mode. Tap-down is a function in which cruise speed can be decreased by 1.6 km/h (1 mph) increments (one tap = 1.6 km/h or 1 mph decrease). The system can tap-down to the low speed lockout of 40 km/h (25 mph). Below this speed, the cruise control will not operate.

DIAGNOSIS

PRELIMINARY INSPECTION

Before beginning diagnosis, perform the following visual inspection and repair as needed:

- Check GAUGES 20A fuse.
- Check for bare, broken, or disconnected wires.
- Check for damaged or disconnected release switches.

If the preliminary inspection reveals no problems, follow the "Cruise Control Functional Check" in this section.

CRUISE CONTROL FUNCTIONAL CHECK

Use the procedure below to check the operating modes of the cruise control system. This procedure should always be used after repair work has been completed on the cruise control system.

1. Slide the OFF-ON-R/A switch to the ON position.
2. Check the low speed lockout:
   - Drive the vehicle at 32 km/h (20 mph). Press the SET switch and release. The cruise control must not engage.
3. Check the set function:
   - Drive the vehicle at a steady speed of 89 km/h (55 mph). Press the SET switch completely and release. The cruise control should engage at approximately 89 km/h (55 mph).
4. Check the brake release:
   - Press the brake pedal. The cruise control must release the throttle, allowing the vehicle speed to drop. The system must not reengage when the brake is released.
5. Check the resume function:
   - With the vehicle speed at approximately 72 km/h (45 mph), slide the OFF-ON-R/A switch momentarily (less than 1 second) to the R/A position. The vehicle should accelerate to approximately 89 km/h (55 mph).
6. Check the coast function:
   - Press the SET switch and hold. Allow the vehicle speed to drop to 80 km/h (50 mph) and release the switch. The cruise control should hold vehicle speed at approximately 80 km/h (50 mph).
7. Check the accelerate function:
   - Slide the OFF-ON-R/A switch to the R/A position and hold. The vehicle speed should begin to increase. Allow the speed to increase to 89 km/h (55 mph) and release the switch. The cruise control should hold the vehicle at approximately 89 km/h (55 mph).
8. Check the resume function:
   - With the vehicle speed at approximately 72 km/h (45 mph), slide the OFF-ON-R/A switch momentarily (less than 1 second) to the R/A position. The vehicle should accelerate to approximately 89 km/h (55 mph).
9. Slide the OFF-ON-R/A switch to the OFF position.
   - The cruise control system must disengage.

If the preliminary inspection and cruise control functional check reveal no problems, refer to Electrical for additional information.

ON-VEHICLE SERVICE

HANDLING ELECTROSTATIC DISCHARGE (ESD) SENSITIVE PARTS

Many solid state electrical components can be damaged by Electrostatic Discharge (ESD). Some will display a label, but many will not (Figure 2).

In order to avoid possible damage to any components, observe the following:

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
   - Slide across the vehicle seat.
   - Sit down or get up.
   - Do any walking.
2. Do not touch exposed electrical terminals on components with your fingers or any tools. Remember, the connector that you are checking might be tied into a circuit that could be damaged by electrostatic discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or between the exposed terminals.
4. Never use a jumper wire, ground, or test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install the part.
6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if components are:
   - Bumped or dropped.
   - Laid on any metal work benches or near components that operate electrically, such as a television, radio, or oscilloscope.

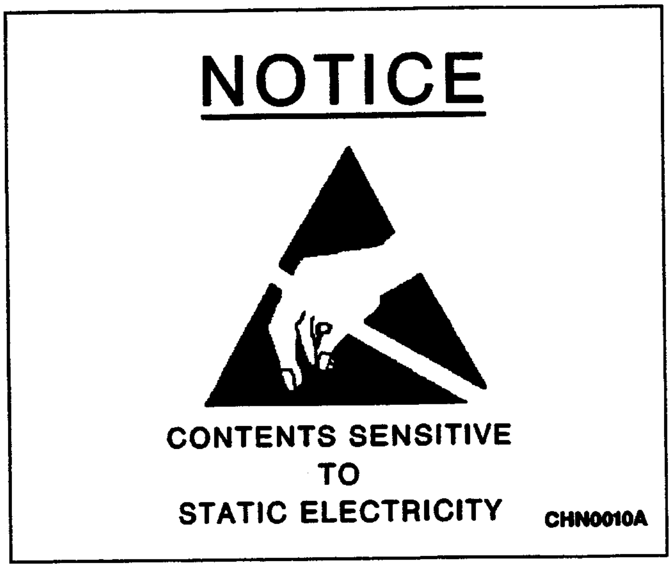


Figure 2—Electrostatic Discharge Label

MULTIFUNCTION SWITCH REPLACEMENT

Refer to Steering Wheel and Column On-Vehicle Service.

BRAKE PEDAL RELEASE SWITCH REPLACEMENT

Refer to SECTION 5.

BLANK

SIR

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Inflatable Restraint Front End Discriminating Sensor Fastener	8 N·m	71 lb in
nflatable Restraint Sensing and Diagnostic Module Fasteners	12 N·m	106 lb in

Scan Tool Data List

The scan tool used provides the following capabilities:

- Read the data list.
- Read current and history trouble codes.
- Clear the diagnostic trouble codes after a repair is completed.

Make sure the scan tool contains an updated cartridge before attempting to communicate with the SIR system. To use the scan tool, connect it to the Data Link Connector (DLC) and turn the ignition switch to the ON position. The scan tool reads serial data sent from the inflatable restraint Sensing and Diagnostic Module (SDM) Serial Data output terminal 5 to the DLC terminal 9.

The SIR Scan Tool Data List contains all restraint related parameters that are available on the scan tool. The list is arranged in the order as they appear on the scan tool.

Use the SIR Scan Tool Data List only after the following is determined:

- Diagnostic System Check is completed.
- No Diagnostic Trouble Codes (DTCs) are set.
- SIR Diagnostics indicates system is functioning properly.

Scan tool values from a properly operating system may be used for comparison with the SIR system you are diagnosing. The SIR Scan Tool Data List represents typical values seen on a properly operating system.

Important: Make sure the scan tool that you are using is functioning properly. Use of a malfunctioning scan tool can result in misdiagnosis and unnecessary parts replacement.

Only the parameters listed below are referenced in this service manual for use in diagnosis. If all values are within the typical range described below, refer to *Intermittents and Poor Connections* for diagnosis.

Scan Tool Parameter	Units Displayed	Typical Data Value
Ignition ON, Engine OFF, Inflatable Restraint IP Module Switch ON (if equipped), and Driver Seat Belt Buckled		
Ignition	Volts	12 V
Lamp Driver	Internal/External	Internal
Driver Resistance	Ohms	2.6 Ω
Passenger Resistance	Ohms	2.2 Ω
Driver Senselo	Volts	4.1 V
Passenger Senselo	Volts	4.1 V
Driver VDIF	Millivolts	4-8 mV
Passenger VDIF	Millivolts	4-8 mV
Warning Lamp Control	On/Off	Off
Lamp Driver Feedback	Active/Inactive	Inactive
Warning Lamp ON	Hours	0 - 182 Hrs
Warning Lamp Cycles	Cycles	0 - 125 Cycles
Driver Seat Belt	Buckled/Unbuckled	Buckled
Pass Air Bag Enable	High/Low	High
Pass Air Bag Disable	High/Low	Low
Suppression Lamp Driver	On/Off	Off

Scan Tool Data Definitions

The SIR Scan Tool Data Definitions contain a brief description of all SIR related parameters available on the scan tool. The list is in the order it appears on the scan tool.

Ignition: The scan tool displays 0–25.5 volts. The Ignition represents the system voltage measured by the SDM at its ignition feed.

Lamp Driver: The scan tool displays Internal or External. The warning lamp control method for a hard wired lamp is Internal. The warning lamp control method for a serial date controlled lamp is External.

Driver Resistance: The scan tool displays 0–6.3 ohms. The SDM performs the resistance measurement test once each ignition cycle and verifies the Ignition 1 and the 23 VLR voltages are within the normal ranges. Then the SDM sources a constant current to the driver deployment loop. The SDM then measures the voltage drop across the deployment loop and converts the measured voltage value to a driver deployment loop resistance value.

Passenger Resistance: The scan tool displays 0–6.3 ohms. The SDM performs the resistance measurement test once each ignition cycle and verifies the Ignition 1 and 23 VLR voltages are within the normal ranges. Then the SDM sources a constant current to the passenger deployment loop. The SDM then measures the voltage drop across the deployment loop and converts the measured voltage value to a passenger deployment loop resistance value.

Driver Senselo: The scan tool displays 0–20 volts. The SDM measures the voltage of the driver low terminal voltage and displays it as Driver Senselo.

Passenger Senselo: The scan tool displays 0–20 volts. The SDM measures the voltage of the passenger low terminal voltage and displays it as Passenger Senselo.

Driver VDIF: The scan tool displays 0–400 millivolts. The SDM measures the voltage difference between driver high and driver low and displays this voltage difference as Driver VDIF.

Passenger VDIF: The scan tool displays 0–400 millivolts. The SDM measures the voltage difference between passenger high and driver low and displays this voltage difference as Passenger VDIF.

Warning Lamp Control: The scan tool displays ON or OFF. The warning lamp state commanded by the SDM.

Lamp Driver Feedback: The scan tool displays Active or Inactive. The warning lamp state detected by the SDM.

Warning Lamp ON: The scan tool displays 0–182 hours. The SDM measures the continous warning lamp on time.

Warning Lamp Cycles: The scan tool displays 0–125 cycles. The ignition cycles of the current warning lamp state.

Driver Seatbelt: The scan tool displays Buckled or Unbuckled. The signal from the drivers seatbelt switch that the seatbelt is fastened.

Pass Air Bag Enable: The scan tool displays High or Low. The state of the Passenger Air Bag IP Module switch ON output.

Pass Air Bag Disable: The scan tool displays High or Low. The state of the Passenger Air Bag IP Module Switch OFF output.

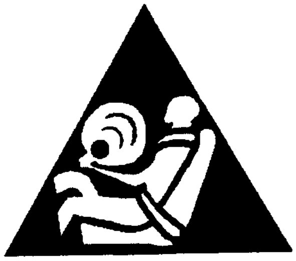
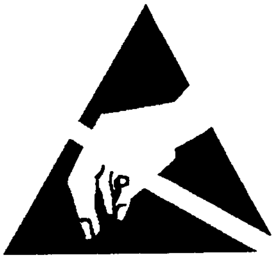
Suppression Lamp Driver: The scan tool displays ON or OFF. The state of the Passenger Air Bag IP Module Switch OFF output driver.

GM SPO Group Numbers

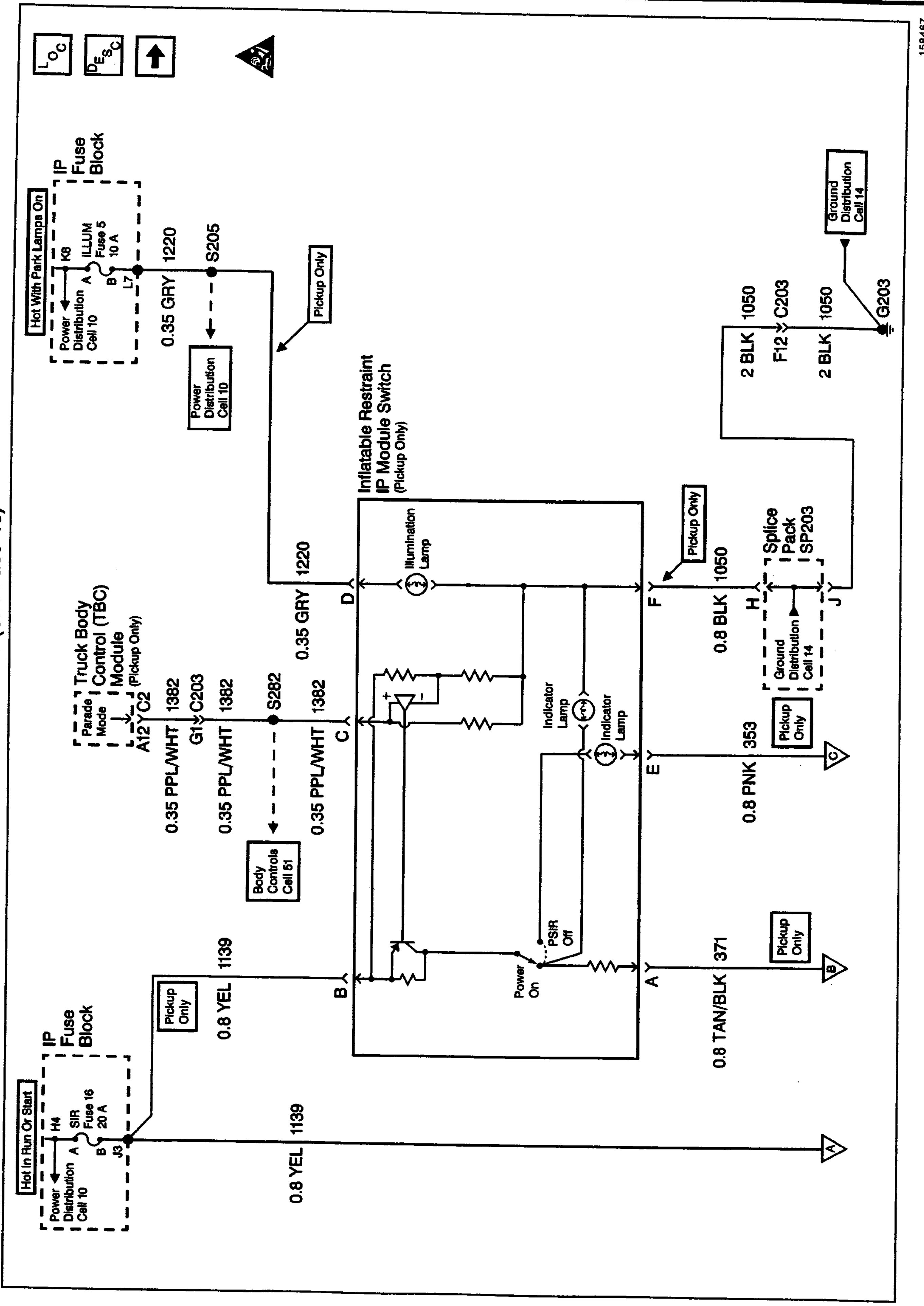
Application	GM SPO Group Number
Inflatable Restraint Front End Discriminating Sensor	16.712
Inflatable Restraint IP Module	16.712
Inflatable Restraint IP Module Switch	16.712
Inflatable Restraint Sensing and Diagnostic Module	16.712
Inflatable Restraint Steering Wheel Module	16.712
Inflatable Restraint Steering Wheel Module Coil	16.712

Schematic and Routing Diagrams

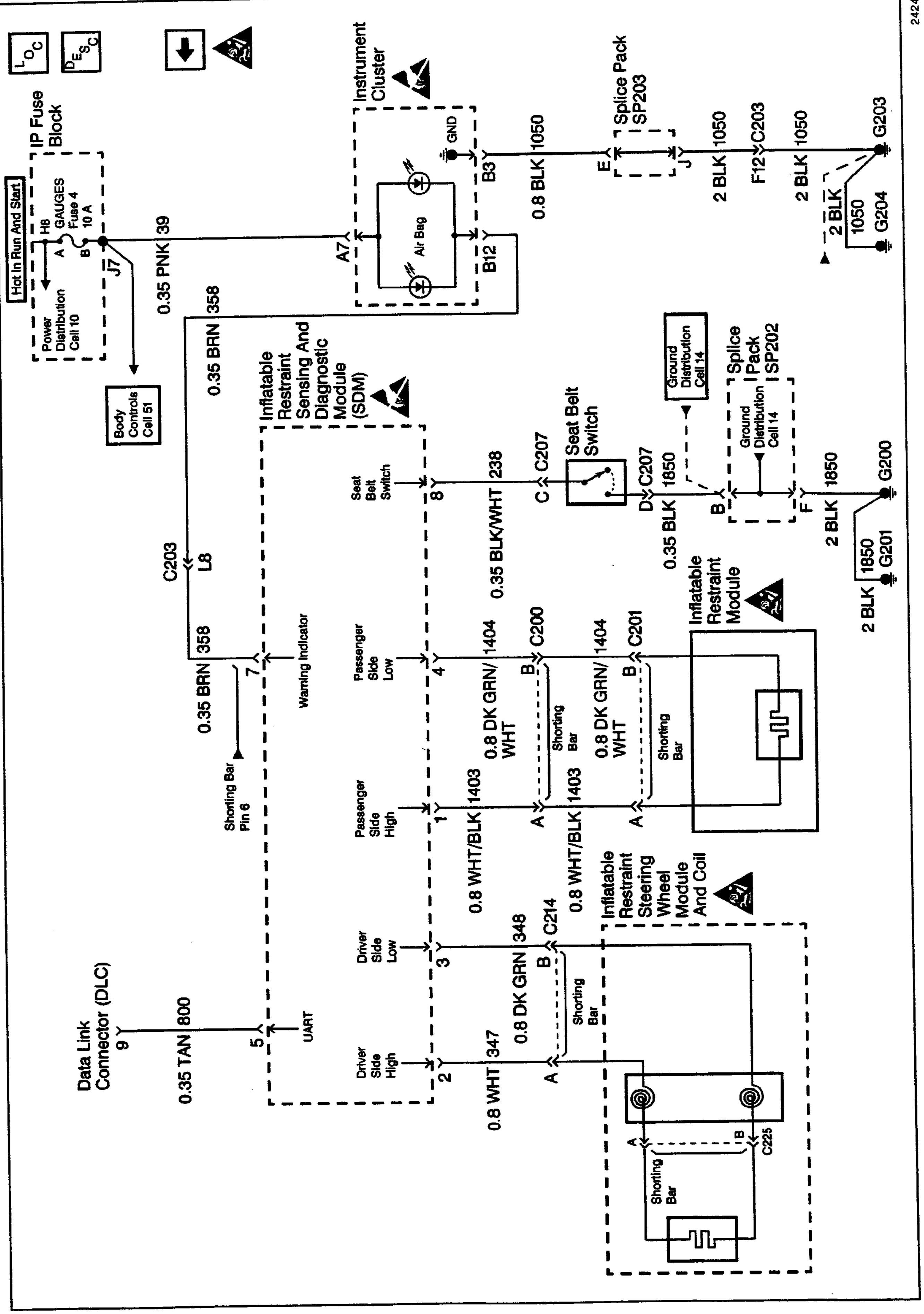
SIR Schematic Icons

Icon	Icon Definition
	Refer to *Servicing The SIR System Caution.*
	Refer to *ESD Notice.*

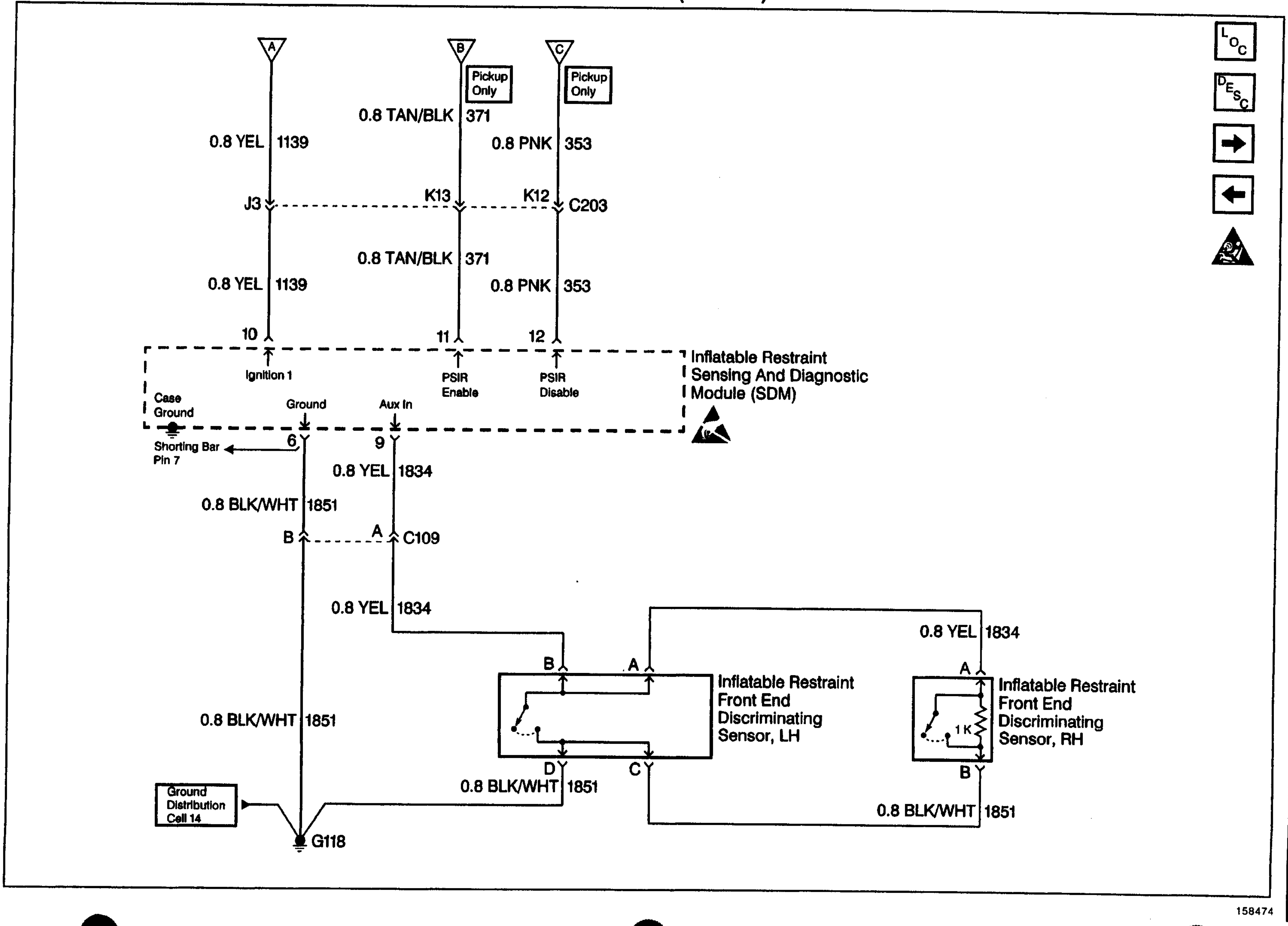
SIR Schematics (SIR Fuse 16)


LOC
DESC
Hot With Park Lamps On
IP Fuse Block
Power Distribution Cell 10
K8
A
ILLUM Fuse 5 10 A
B
L7
0.35 GRY 1220
S205
Power Distribution Cell 10
Pickup Only
Inflatable Restraint IP Module Switch (Pickup Only)
Illumination Lamp
Ground Distribution Cell 14
2 BLK 1050
F12
C203
2 BLK 1050
G203
Pickup Only
1050
F
0.8 BLK
Splice Pack SP203
H
J
Ground Distribution Cell 14
D
0.35 GRY 1220
Truck Body Control (TBC) Module (Pickup Only)
Parade Mode
A12
C2
0.35 PPL/WHT 1382
G1
C203
0.35 PPL/WHT 1382
S282
0.35 PPL/WHT 1382
C
Body Controls Cell 51
Indicator Lamp
Indicator Lamp
E
0.8 PNK 353
Pickup Only
C
PSIR Off
Power On
Hot In Run Or Start
IP Fuse Block
Power Distribution Cell 10
H4
A
SIR Fuse 16 20 A
B
J3
Pickup Only
0.8 YEL 1139
B
0.8 YEL 1139
A
0.8 TAN/BLK 371
Pickup Only
B
A
158467

SIR Schematics (Sensing And Diagnostic Module)


242450
LOC
DESC
IP Fuse Block
Hot In Run And Start
H8
GAUGES
Fuse 4
10 A
A
B
J7
Power Distribution Cell 10
Body Controls Cell 51
0.35 PNK 39
A7
Instrument Cluster
Air Bag
GND
B3
B12
0.8 BLK 1050
Splice Pack SP203
E
J
2 BLK 1050
F12
C203
2 BLK 1050
G203
2 BLK 1050
G204
0.35 BRN 358
Inflatable Restraint Sensing And Diagnostic Module (SDM)
C203
L8
0.35 BRN 358
7
Warning Indicator
Shorting Bar Pin 6
Seat Belt Switch
8
0.35 BLK/WHT 238
C
C207
Seat Belt Switch
D
C207
0.35 BLK 1850
Ground Distribution Cell 14
Splice Pack SP202
Ground Distribution Cell 14
B
F
2 BLK 1850
G200
2 BLK 1850
G201
Passenger Side Low
4
0.8 DK GRN/WHT 1404
B
C200
Shorting Bar
0.8 DK GRN/WHT 1404
B
C201
Shorting Bar
Inflatable Restraint Module
Passenger Side High
1
0.8 WHT/BLK 1403
A
0.8 WHT/BLK 1403
A
Data Link Connector (DLC)
9
0.35 TAN 800
5
UART
Driver Side Low
3
0.8 DK GRN 348
B
C214
Shorting Bar
Inflatable Restraint Steering Wheel Module And Coil
Driver Side High
2
0.8 WHT 347
A
A
B
C225
Shorting Bar

SIR Schematics (Sensors)


LOC
DESC
A
B
C
Pickup Only
Pickup Only
0.8 YEL 1139
0.8 TAN/BLK 371
0.8 PNK 353
J3
K13
K12
C203
0.8 YEL 1139
0.8 TAN/BLK 371
0.8 PNK 353
10
11
12
Ignition 1
PSIR Enable
PSIR Disable
Inflatable Restraint Sensing And Diagnostic Module (SDM)
Case Ground
Ground
Aux In
6
9
Shorting Bar Pin 7
0.8 YEL 1834
0.8 BLK/WHT 1851
B
A
C109
0.8 YEL 1834
0.8 YEL 1834
B
A
A
Inflatable Restraint Front End Discriminating Sensor, LH
Inflatable Restraint Front End Discriminating Sensor, RH
1 K
0.8 BLK/WHT 1851
D
C
B
0.8 BLK/WHT 1851
0.8 BLK/WHT 1851
Ground Distribution Cell 14
G118
158474

Component Locator

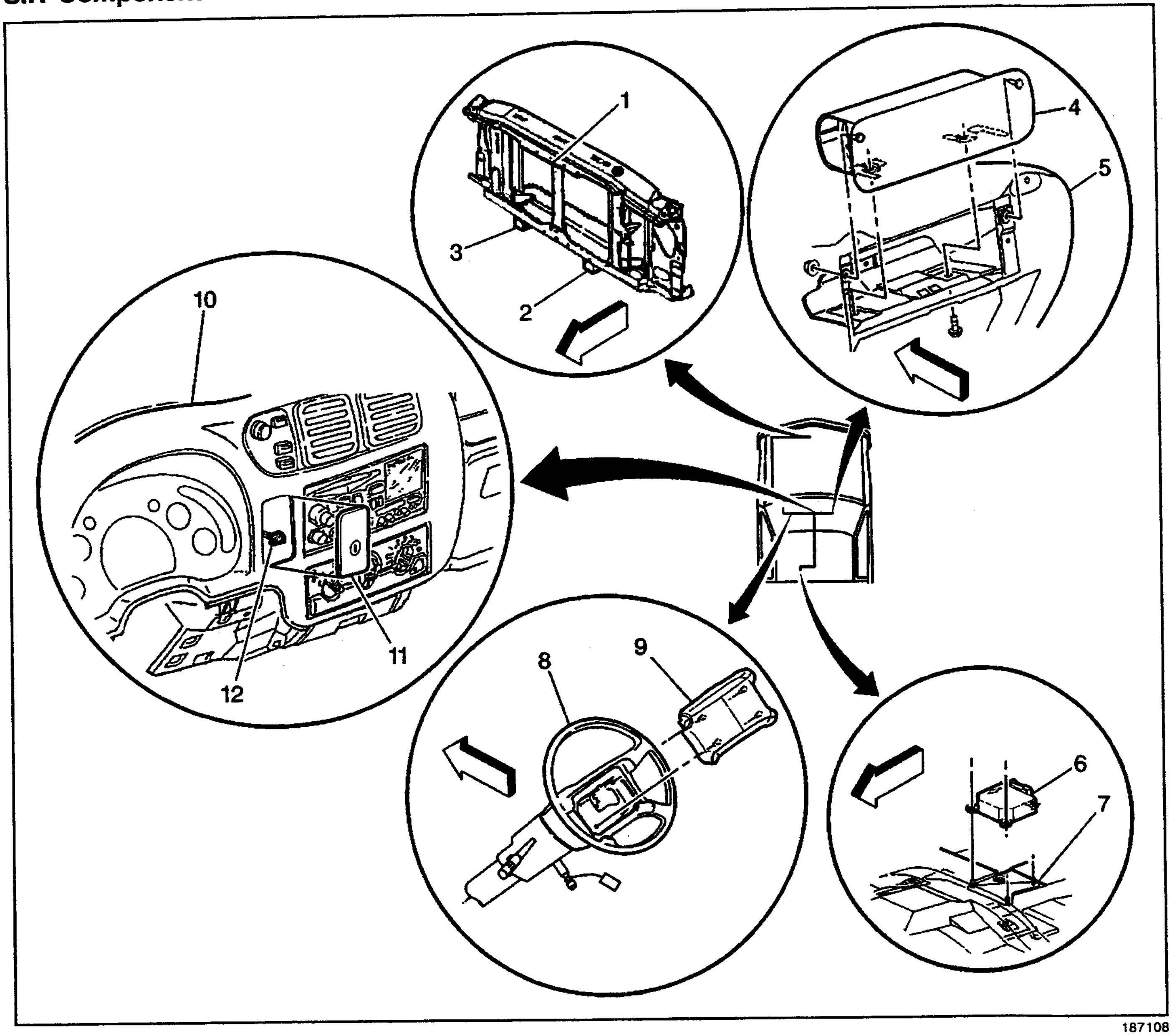
SIR Components

Name	Location	Locator View	Connector End View
Data Link Connector	Lower LH side of instrument panel	—	Inline Harness Connector End Views in Wiring Systems Page 10
GAUGES Fuse 4 (IP Fuse Block)	In the IP Fuse Block	Connector End Views in Wiring Systems, Power Distribution	—
ILLUM Fuse 5 (IP Fuse Block)	In the IP Fuse Block	Connector End Views in Wiring Systems, Power Distribution	—
Inflatable Restraint Front End Discriminating Sensor, LH	On front frame cross-member, just inside the LH frame rail	*component views figure* in SIR in Restraints	—
Inflatable Restraint Front End Discriminating Sensor, RH	On front frame cross-member, just inside the RH frame rail	*component views figure* in SIR in Restraints	—
Inflatable Restraint IP Module Switch	On the instrument panel, to the left of the radio	*component views figure* in SIR in Restraints	—
Inflatable Restraint IP Module	RH side of instrument panel	*component views figure* in SIR in Restraints	—
Inflatable Restraint Sensing And Diagnostic Module	Between driver and passenger seat below the console and carpeting	*component views figure* in SIR in Restraints	—
Inflatable Restraint Steering Wheel Module	In steering wheel	*component views figure* in SIR in Restraints	—
Inflatable Restraint Steering Wheel Module Coil	In steering column	—	—
Instrument Cluster	In the IP ahead of the steering column	Harness Routing Views in Wiring Systems Figure 101	Inline Harness Connector End Views in Wiring Systems Page 28
IP Fuse Block	LH side of the IP near the left front side door jamb switch	Harness Routing Views in Wiring Systems Figure 4	Connector End Views in Wiring Systems, Power Distribution
Seat Belt Switch	Front body harness to seat bet switch, near front seat belt receiver	Harness Routing Views in Wiring Systems Figure 109	—
SIR Fuse 16 (IP Fuse Block)	In the IP Fuse Block	Connector End Views in Wiring Systems, Power Distribution	—
Truck Body Control Module	Lower rear of IP on the heater assembly	Harness Routing Views in Wiring Systems Figure 5	—
Truck Body Control Module Connector C2 (24 Cavities)	Lower rear of IP on the heater assembly	Harness Routing Views in Wiring Systems Figure 5	Inline Harness Connector End Views in Wiring Systems Page 45

SIR Components (cont'd)

Name	Location	Locator View	Connector End View
C109 (SIR Body harness to antilock brake 4WAL harness connector) (2 Cavities)	LH side of engine compartment, near the electronic brake control module)	—	—
C200 (SIR IP Harness to Body Harness Connector) (2 Cavities)	RH side of dash, part of Connector C203 assembly	Harness Routing Views in Wiring Systems Figure 45	—
C201 (Passenger Inflatable Restraint pigtail to IP Harness Connector) (2 Cavities)	Near Passenger Inflatable Restraint Module	—	—
C203 (Body Harness to IP Harness) (116 Cavities)	RH side of dash	Harness Routing Views in Wiring Systems Figure 41	Inline Harness Connector End Views in Wiring Systems Page 71
C207 (Seat Belt Switch Pigtail Connector, 2 Cavities)	Driver's Seat Belt Switch pigtail lead connector	—	—
C214 (SIR Body harness to steering column harness) (2 Cavities)	Front of dash area, near steering column	Harness Routing Views in Wiring Systems Figure 5	—
G118 (Circuit 1851, 4WAL/SIR Harness)	RH frame rail forward of RH front wheel	Harness Routing Views in Wiring Systems Figure 22	—
G200 (Circuit 1850, Body Harness)	LH front of dash panel, above grommet P100	Harness Routing Views in Wiring Systems Figure 5	—
G201 (Circuit 1850, Body Harness)	LH front of dash panel, above grommet P100	Harness Routing Views in Wiring Systems Figure 5	—
G203 (Circuit 1050, Body Harness)	RH Dash panel, between IP Body Connector C203 and Splice Packs	Harness Routing Views in Wiring Systems Figure 56	—
G204 (Circuit 1050, Body Harness)	RH Dash panel, between IP Body Connector C203 and Splice Packs	Harness Routing Views in Wiring Systems Figure 56	—
S205 (Circuit 1220, IP Harness)	Between the breakouts for the radio and Truck Body Control Module Connector C3, 8 cm from the breakout to the radio	Harness Routing Views in Wiring Systems Figure 41	—
SP202 (379, 1850 Splice Pack, Body Harness)	Strapped to body harness at LH center of the front of dash area	—	—
SP203 (Circuit 1050 Splice Pack, IP Harness)	On the IP Assembly, in front of the IP ashtray assembly	Harness Routing Views in Wiring Systems Figure 40	—

SIR Component Views



Legend

(1) Radiator Support Bracket
(2) LH Inflatable Restraint Discriminating Sensor
(3) RH Inflatable Restraint Discriminating Sensor
(4) Inflatable Restraint IP Module
(5) Instrument Panel
(6) Inflatable Restraint Sensing and Diagnostic Module
(7) Floor Pan
(8) Steering Wheel
(9) Inflatable Restraint Steering Wheel Module
(10) Instrument Panel
(11) Inflatable Restraint IP Module Switch
(12) Inflatable Restraint IP Module Switch Connector

Diagnostic Information and Procedures

Intermittents and Poor Connections

Most intermittents are caused by faulty electrical connections or wiring. Some items to check are:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals. All connector terminals in problem circuits should be checked carefully to ensure good contact tension. Use a corresponding mating terminal to check for proper tension. Refer to Checking Terminal Contact in Electrical Diagnosis for the specific procedure.
- *J 35616-A* Connector Test Adapter Kit must be used whenever a diagnostic procedure requests checking or probing a terminal. Using the adapter will ensure that no damage to the terminal will occur, as well as giving an idea of whether contact tension is sufficient. If contact tension seems incorrect, refer to Checking Terminal Contact in Electrical Diagnosis for the specific procedure.
- Poor terminal to wire connection. Some conditions which fall under this description are poor crimps, poor solder joints, crimping over wire insulation rather than the wire itself, corrosion in the wire to terminal contact area, etc.
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only one or two strands of a multi-strand type wire are intact, resistance could be far too high.

To avoid any of the above problems when making wiring or terminal repairs, always follow the instructions for wiring and terminal repair detailed in *Wiring Repair* in this section.

SIR General Diagnosis

Diagnostic Trouble Codes

Caution: In order to avoid deploying the air bag when troubleshooting the SIR system, use only the equipment specified in this manual and the instructions given in this manual. Failure to use the specified equipment as instructed could cause air bag deployment, personal injury to you or someone else, or unnecessary SIR system repairs.

The SIR Diagnostic System Check must always be the starting point of any SIR system diagnosis. The SIR Diagnostic System Check checks for proper AIR BAG warning lamp operation and checks for SIR Diagnostic Trouble Codes (DTC) using the scan tool. The following describes the difference between current and history DTCs:

- Current DTCs – Malfunctions that are presently being detected. Random Access Memory (RAM) stores the current DTCs. Turning the ignition switch to the OFF position erases current DTCs. The presence of a current DTC will cause the inflatable restraint Sensing and Diagnostic Module (SDM) to turn ON the AIR BAG warning lamp.
- History DTCs – All malfunctions detected since last clearing of history memory. Electrically Erasable Programmable Read Only Memory (EEPROM) stores the history DTCs. A scan tool clear codes command will erase history DTCs.

Some DTCs are latched and can not be cleared. Latched DTCs will require replacement of the SDM after proper diagnostics.

Use of Special Tools

You should be familiar with the tools in this service category listed under the heading Special Tools. You should know how to measure voltage and resistance. Diagnosis requires proper use of the following tools:

- The *Scan Tool*
- The *J 38715-A* SIR Driver/Passenger Load Tool
- The *J 35616-A* Connector Test Adapter Kit
- The *J 39200* Digital Multimeter
- The *J 38715-96* SIR Shorting Bar Tool

SIR Diagnostic System Check

Caution: In order to avoid deploying the air bag when troubleshooting the SIR system, use only the equipment specified in this manual and the instructions given in this manual. Failure to use the specified equipment as instructed could cause air bag deployment, personal injury to you or someone else, or unnecessary SIR system repairs.

Caution: If any water enters the vehicle's interior up to the level of the carpet or higher and soaks the carpet, the Sensing and Diagnostic Module (SDM) and the SDM harness connector may need to be replaced. The SDM could be activated when powered, which could cause deployment of the air bag(s) and result in personal injury. Before attempting these procedures, the SIR system must be disabled. Refer to Disabling SIR System in this section. With the ignition OFF, inspect the SDM mounting area, including the carpet. If any significant soaking or evidence of significant soaking is detected, you MUST:

- ***Remove all water***
- ***Repair the water damage***
- ***Replace the SDM harness connector***
- ***Replace the SDM***

Failure to follow these procedures could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

These diagnostic procedures will help you to find and repair SIR system malfunctions. This service category also contains information for repairing SIR system malfunctions. For best results, use the diagnostic tables, and follow the sequence listed below:

1. Perform the SIR Diagnostic System Check. All SIR diagnostics must begin with the SIR Diagnostic System Check. The SIR Diagnostic System Check determines the following:
   - Proper AIR BAG warning lamp operation
   - Ability of the SDM to communicate through the Data Link Connector (DLC)
   - Existence of SIR Diagnostic Trouble Codes (DTC)
2. Refer to the diagnostic table as directed by the SIR Diagnostic System Check. The diagnostic tables will help enable you to diagnose any SIR system malfunction. Bypassing these procedures may result in the following:
   - Extended Diagnostic Time
   - Incorrect Diagnosis
   - Incorrect Parts Replacement
3. Repeat the SIR Diagnostic System Check after you perform any repair or diagnostic procedures. This will verify that you correctly performed the repair. This will also ensure that no other malfunctions exist.

Circuit Description

The ignition switch supplies Ignition 1 voltage to the inflatable restraint Sensing and Diagnostic Module (SDM) at terminal 10 using the SIR Fuse. When the ignition switch is first turned to the ON position, the SDM responds by flashing the AIR BAG warning lamp seven times, then turning it OFF, while performing tests on the SIR system.

Diagnostic Aids

You must diagnose the diagnostic trouble codes in the order specified by the SIR Diagnostic System Check. Failure to do so may result in the following:

- Extended Diagnostic Time
- Incorrect Diagnosis
- Incorrect Parts Replacement

Test Description

Refer to step numbers on the diagnostic table.

2. The inflatable restraint IP module switch must be in the ON position to perform the system diagnostic check.
3. The AIR BAG warning lamp should flash seven times after the ignition switch is first turned to the ON position.
4. The AIR BAG warning lamp indicates improper operation. This test differentiates a warning lamp stays ON condition from a warning lamp does not come ON condition.
5. The AIR BAG warning lamp should turn OFF after flashing seven times.
6. This test checks for the proper operation of the Serial Data line.
8. This test will identify the stored diagnostic trouble codes and whether they are current or history.
10. This test checks for the proper operation of the Serial Data line.
11. This test refers to the appropriate DTC Table Diagnostic Aids for diagnosis of the history DTCs.

SIR Diagnostic System Check

Step	Action	Value(s)	Yes	No
1	Does this vehicle have a inflatable restraint IP module switch?	—	*Go to Step 2*	*Go to Step 3*
2	1. Turn the ignition switch to the ON position. 2. Turn the inflatable restraint IP module switch to the OFF position and then back to the ON position. Is the inflatable restraint IP module switch in the ON position?	—	*Go to Step 3*	—
3	Note the AIR BAG warning lamp while turning the ignition switch to the ON position. Does the AIR BAG warning lamp flash seven times?	—	*Go to Step 5*	*Go to Step 4*
4	Does the AIR BAG warning lamp come ON steady?	—	Go to *AIR BAG Warning Lamp Comes On Steady*	Go to *AIR BAG Warning Lamp Does Not Come On*
5	Note the AIR BAG warning lamp after it flashed seven times. Does the AIR BAG warning lamp go OFF?	—	*Go to Step 9*	*Go to Step 6*
6	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the Data Link Connector. Follow the directions in the instruction manual of the scan tool. 3. Turn the ignition switch to the ON position. 4. Request the SIR Diagnostic Trouble Code (DTC) display. Is a current DTC displayed?	—	*Go to Step 8*	*Go to Step 7*
7	Does the scan tool indicate no data received?	—	Go to Data Link Connector in Wiring Systems	Go to *SDM Integrity Check*
8	1. Turn the ignition switch to the OFF position. 2. Record the displayed DTCs on the repair order, specifying as current or history. • When DTC B1051 is set, refer to *DTC B1051 Deployment Commanded.* • When DTC B1018 is set, refer to *DTC B1018 Passenger Deployment Loop Short to GND.* • When DTC B1024 is set, refer to *DTC B1024 Driver Deployment Loop Short to Ground.* 3. Diagnose the remaining DTCs from lowest to highest. 4. When only history DTCs exist, refer to Diagnostic Aids for that specific DTC. A history DTC indicates the malfunction has been repaired or is intermittent. Has current DTC diagnosis been performed and the current DTCs cleared?	—	*Go to Step 3*	—

SIR Diagnostic System Check (cont'd)

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the Data Link Connector. 3. Turn the ignition switch to the ON position. 4. Request the SIR Diagnostic Trouble Code (DTC) display. Is a history DTC displayed?	—	*Go to Step 11*	*Go to Step 10*
10	Does the scan tool indicate no data received?	—	Go to Data Link Connector in Wiring Repairs	System OK
11	1. Turn the ignition switch to the OFF position. 2. Record the displayed DTCs on the repair order specifying as history. 3. When DTC B1071 is set, refer to *DTC B1071 Internal SDM Failure.* 4. For all other DTCs, Refer to Diagnostic Aids for that specific DTC. A history DTC indicates the malfunction has been repaired or is intermittent. Has the diagnosis been performed and the DTCs cleared?	—	*Go to Step 3*	—

SDM Integrity Check

Circuit Description

When the inflatable restraint Sensing and Diagnostic Module (SDM) recognizes IGNITION 1 voltage, applied to terminal 10, is greater than 8.2 volts, the SDM flashes the AIR BAG warning lamp seven times to verify operation. At this time the SDM performs POWER-ON tests followed by the RESISTANCE MEASUREMENT test and the CONTINUOUS MONITORING tests. Upon detection of a malfunction, the SDM sets a current Diagnostic Trouble Code (DTC) and illuminates the AIR BAG warning lamp. The SDM will clear current DTCs and preserve them in a history file when:

- The malfunction is no longer detected.
- The ignition switch is cycled.

This does not include DTCs B1018, B1024, B1051, B1053, and B1071. DTCs B1018, B1024, B1051, B1053 are latched codes. You cannot clear a latched code. DTC B1071 may not clear after you issue a clear codes command.

Important: Repair the malfunction that set the DTC before you replace the SDM.

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test confirms a circuit malfunction. If no current malfunction is occurring (history DTC set), refer to the diagnostic aids for the appropriate DTC table as indicated through the scan tool. Do not replace the inflatable restraint Sensing and Diagnostic Module (SDM) for a history DTC other than DTC B1071.
3. This test checks for a malfunction introduced into the SIR system during the diagnostic process. It is unlikely that a malfunctioning SDM would cause a new malfunction to occur during this process.
4. When you have found all circuitry outside the SDM to operate properly, as indicated by the appropriate diagnostic table, replace the SDM.

This table assumes that the SIR Diagnostic System Check or a Diagnostic Trouble Code table diagnosis has been performed. When all circuitry outside the inflatable restraint Sensing and Diagnostic Module (SDM) has been found to operate properly, as indicated by the appropriate diagnostic table, and the symptom or DTC remains current, the following diagnostic procedures must be performed to verify the need for SDM replacement.

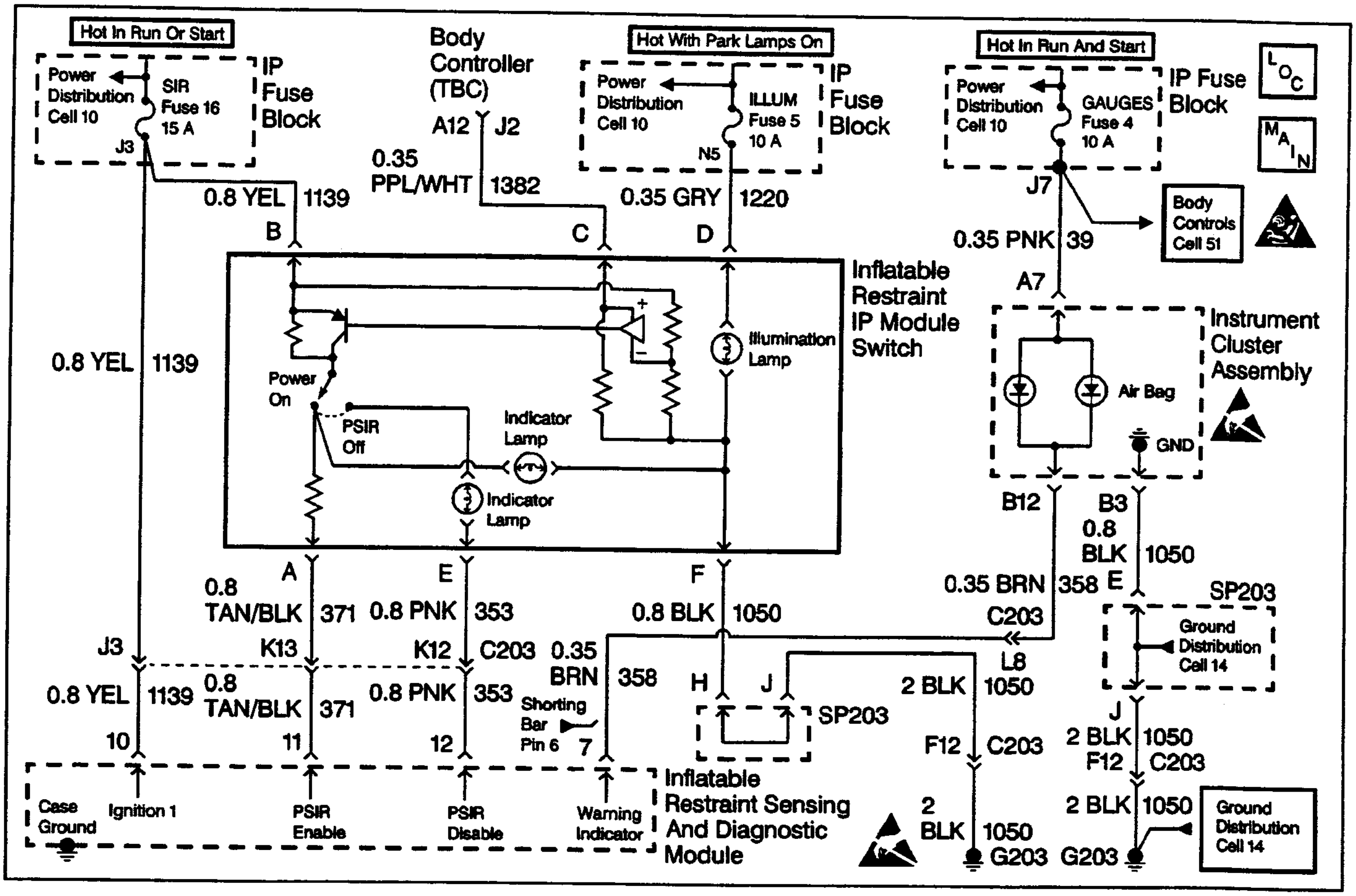
SDM Integrity Check

Step	Action	Value(s)	Yes	No
1	Were you sent here from a symptom table or a Diagnostic Trouble Code (DTC) table?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Reconnect all the SIR components, make sure all the components are properly mounted. 3. Make sure the ignition switch has been turned to the OFF position for at least 30 seconds. 4. Note the AIR BAG warning lamp while turning the ignition switch to the ON position. Does the AIR BAG warning lamp flash seven times then go OFF?	—	*Go to Step 7*	*Go to Step 3*
3	Using the scan tool, request the SIR DTC display. Is the same symptom or DTC occurring as when the SIR Diagnostic System Check was first performed?	—	*Go to Step 4*	Go to the appropriate DTC table
4	1. Clear the SIR DTCs. 2. Turn the ignition switch to the OFF position for at least 30 seconds. 3. Note the AIR BAG warning lamp while turning the ignition switch to the ON position. Does the AIR BAG warning lamp flash seven times then go OFF?	—	System OK	*Go to Step 5*

SDM Integrity Check (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition switch to the OFF position. 2. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Has the SDM been replaced?	—	*Go to Step 6*	—
6	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	Go to *SIR Diagnostic System Check*	—
7	Clear the SIR DTCs. Have the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

AIR BAG Warning Lamp Comes On Steady


Hot In Run Or Start
Power Distribution Cell 10
SIR Fuse 16 15 A
IP Fuse Block
J3
0.8 YEL 1139
B
Body Controller (TBC)
A12 J2
0.35 PPL/WHT 1382
C
Hot With Park Lamps On
Power Distribution Cell 10
ILLUM Fuse 5 10 A
N5
IP Fuse Block
0.35 GRY 1220
D
Hot In Run And Start
Power Distribution Cell 10
GAUGES Fuse 4 10 A
IP Fuse Block
J7
Body Controls Cell 51
0.35 PNK 39
A7
Inflatable Restraint IP Module Switch
Power On
PSIR Off
Indicator Lamp
Indicator Lamp
Illumination Lamp
Instrument Cluster Assembly
Air Bag
GND
B12
B3
0.8 BLK 1050
0.35 BRN 358
E
C203
SP203
Ground Distribution Cell 14
0.8 YEL 1139
0.8 TAN/BLK 371
A
0.8 PNK 353
E
F
0.8 BLK 1050
J3
K13
K12
C203
0.35 BRN 358
L8
0.8 YEL 1139
0.8 TAN/BLK 371
0.8 PNK 353
Shorting Bar Pin 6
7
H
J
2 BLK 1050
SP203
J
2 BLK 1050
F12 C203
F12 C203
10
11
12
Case Ground
Ignition 1
PSIR Enable
PSIR Disable
Warning Indicator
Inflatable Restraint Sensing And Diagnostic Module
2 BLK 1050
G203
2 BLK 1050
G203
Ground Distribution Cell 14

208127

Circuit Description

When the ignition switch is first turned to the ON position, the GAUGES Fuse applies battery voltage to the AIR BAG warning lamp that is connected to INFLATABLE RESTRAINT INDICATOR, terminal 7. The SIR Fuse applies battery voltage to the IGNITION 1 input, terminal 10. The inflatable restraint Sensing and Diagnostic Module (SDM) responds by flashing the AIR BAG warning lamp seven times. If IGNITION 1 is outside of the normal operating voltage range (8.2 volts - 17.1 volts), the AIR BAG warning lamp will come ON solid with no DTCs set.

Diagnostic Aids

In order to disable the shorting bar from terminal 6 to terminal 7 inside the inflatable restraint Sensing and Diagnostic Module (SDM) harness connector, the following two conditions must be met:

- The SDM harness connector must be properly connected to the SDM.
- The Connector Position Assurance (CPA) must be properly installed in the SDM harness connector.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test checks for sufficient IGNITION 1 voltage applied to the SDM.
3. This test checks for excessive IGNITION 1 voltage applied to the SDM.
4. This test checks for a properly installed CPA.
6. This test determines if the SDM is turning on the AIR BAG warning lamp.
7. This test checks for a damaged shorting bar.
9. This test determines whether the malfunction is a short to ground in CKT 358.
12. An open SIR Fuse would cause the AIR BAG warning lamp to come on steady.
13. This test checks whether a short to ground caused the SIR Fuse to open.
14. This test determines whether the short to ground is due to a short in the wiring or internal to the SDM.
16. This test determines whether the short to ground is due to a short in the wiring or internal to the inflatable restraint IP module switch.
21. This test checks for a disconnected SDM.
27. This test checks for an open in the IGNITION 1 circuit.

AIR BAG Warning Lamp Comes On Steady

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. Is IGNITION more than the specified value?	8.2 V	*Go to Step 3*	*Go to Step 12*
3	1. Set the parking brake. 2. Start the engine. 3. Using the scan tool, read the SIR data list. Is IGNITION more than the specified value?	17.1 V	Go to Starter and Charging System Check in Engine Electrical	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Inspect the inflatable restraint Sensing and Diagnostic Module (SDM) harness connector CPA. Is the CPA properly installed?	—	*Go to Step 6*	*Go to Step 5*
5	Properly install the CPA. Are the repairs complete?	—	Go to *SIR Diagnostic System Check*	—
6	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Install *J 38715-96* SIR Shorting Bar Tool within the SDM harness connector. 4. Install the CPA. 5. Turn the ignition switch to the ON position. Does the AIR BAG warning lamp come ON steady?	—	*Go to Step 7*	Go to *SDM Integrity Check*
7	1. Turn the ignition switch to the OFF position. 2. Remove *J 38715-96* from the SDM harness connector. 3. Inspect the shorting bar within the SDM harness connector. Is the shorting bar damaged or corroded?	—	*Go to Step 8*	*Go to Step 9*
8	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 28*	—
9	1. Install *J 38715-96* within the SDM harness connector. 2. Install the CPA. 3. Disconnect the instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges. 4. Zero the *J 39200* Digital Multimeter. 5. Measure the resistance from the SDM harness connector terminal 7 to ground. Is the resistance reading less then the specified value?	OL	*Go to Step 10*	*Go to Step 11*

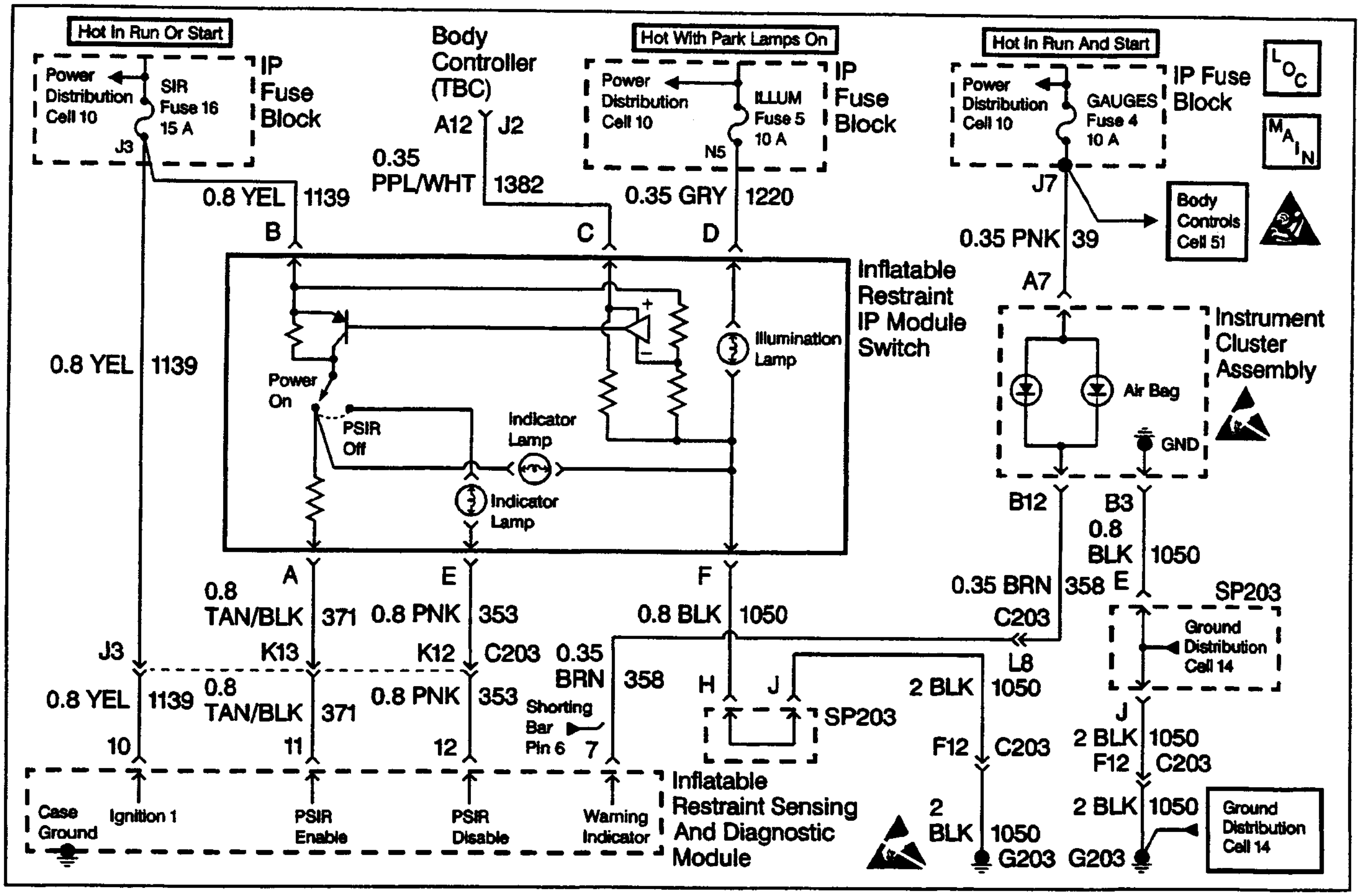
AIR BAG Warning Lamp Comes On Steady (cont'd)

Step	Action	Value(s)	Yes	No
10	Repair a short to ground condition in CKT 358. Are the repairs complete?	—	*Go to Step 29*	—
11	Service the instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges. Are the repairs complete?	—	*Go to Step 29*	—
12	1. Turn the ignition switch to the OFF position. 2. Remove the SIR Fuse. 3. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 21*	*Go to Step 13*
13	1. Replace the SIR Fuse. 2. Turn the ignition switch to the ON position for 10 seconds. 3. Turn the ignition switch to the OFF position. 4. Remove the SIR Fuse. 5. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 20*	*Go to Step 14*
14	1. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Replace the SIR Fuse. 3. Turn the ignition switch to the ON position for 10 seconds. 4. Turn the ignition switch to the OFF position. 5. Remove the SIR Fuse. 6. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 19*	*Go to Step 15*
15	Does this vehicle have a inflatable restraint IP module switch?	—	*Go to Step 16*	*Go to Step 18*
16	1. Disconnect the inflatable restraint IP module switch. Refer to *Infl Rst IP Module Switch Replacement.* 2. Replace the SIR Fuse. 3. Turn the ignition switch to the ON position, wait 10 seconds, then turn the ignition switch Off. 4. Remove and inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 17*	*Go to Step 18*
17	1. Replace the inflatable restraint IP module switch. Refer to *Infl Rst IP Module Switch Replacement.* 2. Install the SIR Fuse. Has the inflatable restraint IP module switch been replaced and the SIR Fuse installed?	—	*Go to Step 29*	—
18	1. Repair a short to ground condition in CKT 1139. 2. Connect the SDM. 3. Replace the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—
19	1. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Install the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—

AIR BAG Warning Lamp Comes On Steady (cont'd)

Step	Action	Value(s)	Yes	No
20	Install the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—
21	Inspect the SDM harness connector. Is the connector securely connected to the SDM?	—	*Go to Step 23*	*Go to Step 22*
22	1. Properly connect the SDM harness connector. 2. Install the CPA. Are the repairs complete?	—	*Go to Step 29*	—
23	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Check for proper connection to the SDM at terminal 10. Is the SDM harness connector terminal damaged or corroded?	—	*Go to Step 24*	*Go to Step 25*
24	Replace the SDM harness connector. Refer to *Wiring Repair* Are the repairs complete?	—	*Go to Step 29*	—
25	Inspect the SDM terminals for damage or corrosion. Are any terminals damaged or corroded?	—	*Go to Step 26*	*Go to Step 27*
26	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 22*	—
27	Measure the resistance from the SDM harness connector terminal 10 to each terminal of the SIR Fuse fuseholder. Is either resistance reading within the specified values?	0–5 Ω	Go to *SDM Integrity Check*	*Go to Step 29*
28	Repair an open condition in CKT 1139. Are the repairs complete?	—	*Go to Step 29*	—
29	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	Go to *SIR Diagnostic System Check*	—

AIR BAG Warning Lamp Does Not Come On


Hot In Run Or Start
Power Distribution Cell 10
SIR Fuse 16 15 A
IP Fuse Block
J3
Body Controller (TBC)
A12
J2
0.35 PPL/WHT
1382
Hot With Park Lamps On
Power Distribution Cell 10
ILLUM Fuse 5 10 A
N5
IP Fuse Block
Hot In Run And Start
Power Distribution Cell 10
GAUGES Fuse 4 10 A
IP Fuse Block
J7
Body Controls Cell 51
0.8 YEL
1139
B
C
0.35 GRY
1220
D
0.35 PNK
39
A7
Inflatable Restraint IP Module Switch
Instrument Cluster Assembly
Air Bag
GND
Power On
PSIR Off
Indicator Lamp
Illumination Lamp
Indicator Lamp
0.8 YEL
1139
B12
B3
0.8 BLK
1050
0.35 BRN
358
E
SP203
C203
L8
Ground Distribution Cell 14
A
0.8 TAN/BLK
371
E
0.8 PNK
353
F
0.8 BLK
1050
J3
K13
K12
C203
0.35 BRN
358
H
J
2 BLK
1050
SP203
J
0.8 YEL
1139
0.8 TAN/BLK
371
0.8 PNK
353
Shorting Bar
Pin 6
10
11
12
7
F12
C203
2 BLK
1050
F12
C203
Case Ground
Ignition 1
PSIR Enable
PSIR Disable
Warning Indicator
Inflatable Restraint Sensing And Diagnostic Module
2 BLK
1050
G203
2 BLK
1050
Ground Distribution Cell 14
G203
L O C
M A I N

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Circuit Description

When the ignition switch is first turned to the ON position, the GAUGES Fuse applies battery voltage to the AIR BAG warning lamp that is connected to Air Bag Indicator Control, terminal 7. The SIR Fuse applies battery voltage to the IGNITION 1 input, terminal 10. The inflatable restraint Sensing and Diagnostic Module (SDM) responds by flashing the AIR BAG warning lamp seven times.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test checks for sufficient IGNITION 1 voltage applied to the SDM.
3. This test checks for excessive IGNITION 1 voltage applied to the SDM.
4. This test checks for a properly installed CPA.
6. This test determines if the SDM is turning on the AIR BAG warning lamp.
7. This test checks for a damaged shorting bar.
9. This test determines whether the malfunction is a short to ground in CKT 358.
12. An open SIR Fuse would cause the AIR BAG warning lamp to come on steady.
13. This test checks whether a short to ground caused the SIR Fuse to open.
14. This test determines whether the short to ground is due to a short in the wiring or internal to the SDM.
16. This test determines whether the short to ground is due to a short in the wiring or internal to the inflatable restraint IP module switch.
21. This test checks for a disconnected SDM.
27. This test checks for an open in the IGNITION 1 circuit.

AIR BAG Warning Lamp Does Not Come On

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. Is IGNITION more than the specified value?	8.2 V	*Go to Step 3*	*Go to Step 12*
3	1. Set the parking brake. 2. Start the engine. 3. Using the scan tool, read the SIR data list. Is IGNITION more than the specified value?	17.1 V	Go to Starter and Charging System Check in Engine Electrical	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Inspect the inflatable restraint Sensing and Diagnostic Module (SDM) harness connector CPA. Is the CPA properly installed?	—	*Go to Step 6*	*Go to Step 5*
5	Properly install the CPA. Are the repairs complete?	—	Go to *SIR Diagnostic System Check*	—
6	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Install *J 38715-96* SIR Shorting Bar Tool within the SDM harness connector. 4. Install the CPA. 5. Turn the ignition switch to the ON position. Does the AIR BAG warning lamp come ON steady?	—	*Go to Step 7*	Go to *SDM Integrity Check*
7	1. Turn the ignition switch to the OFF position. 2. Remove *J 38715-96* from the SDM harness connector. 3. Inspect the shorting bar within the SDM harness connector. Is the shorting bar damaged or corroded?	—	*Go to Step 8*	*Go to Step 9*
8	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 28*	—
9	1. Install *J 38715-96* within the SDM harness connector. 2. Install the CPA. 3. Disconnect the instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges. 4. Zero the *J 39200* Digital Multimeter. 5. Measure the resistance from the SDM harness connector terminal 7 to ground. Is the resistance reading less then the specified value?	OL	*Go to Step 10*	*Go to Step 11*

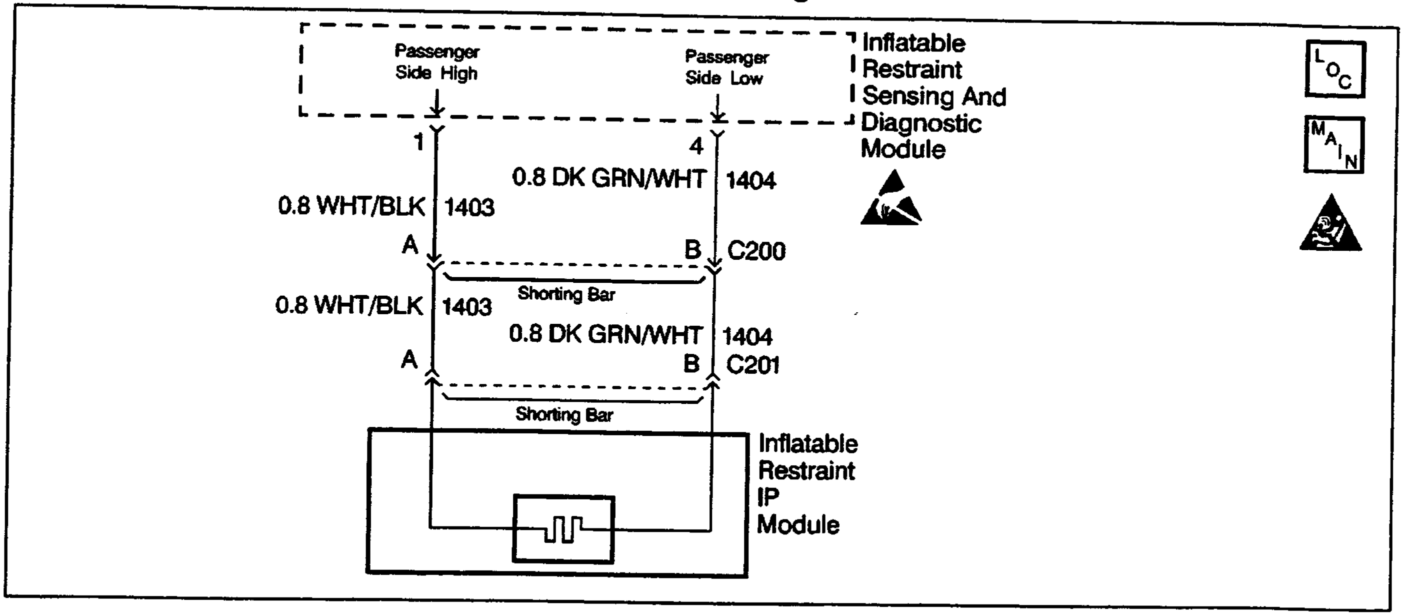
AIR BAG Warning Lamp Does Not Come On (cont'd)

Step	Action	Value(s)	Yes	No
10	Repair a short to ground condition in CKT 358. Are the repairs complete?	—	*Go to Step 29*	—
11	Service the instrument cluster. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges. Are the repairs complete?	—	*Go to Step 29*	—
12	1. Turn the ignition switch to the OFF position. 2. Remove the SIR Fuse. 3. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 21*	*Go to Step 13*
13	1. Replace the SIR Fuse. 2. Turn the ignition switch to the ON position for 10 seconds. 3. Turn the ignition switch to the OFF position. 4. Remove the SIR Fuse. 5. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 20*	*Go to Step 14*
14	1. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Replace the SIR Fuse. 3. Turn the ignition switch to the ON position for 10 seconds. 4. Turn the ignition switch to the OFF position. 5. Remove the SIR Fuse. 6. Inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 19*	*Go to Step 15*
15	Does this vehicle have a inflatable restraint IP module switch?	—	*Go to Step 16*	*Go to Step 18*
16	1. Disconnect the inflatable restraint IP module switch. Refer to *Infl Rst IP Module Switch Replacement.* 2. Replace the SIR Fuse. 3. Turn the ignition switch to the ON position, wait 10 seconds, then turn the ignition switch Off. 4. Remove and inspect the SIR Fuse. Is the SIR Fuse good?	—	*Go to Step 17*	*Go to Step 18*
17	1. Replace the inflatable restraint IP module switch. Refer to *Infl Rst IP Module Switch Replacement.* 2. Install the SIR Fuse. Has the inflatable restraint IP module switch been replaced and the SIR Fuse installed?	—	*Go to Step 29*	—
18	1. Repair a short to ground condition in CKT 1139. 2. Connect the SDM. 3. Replace the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—
19	1. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Install the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—

AIR BAG Warning Lamp Does Not Come On (cont'd)

Step	Action	Value(s)	Yes	No
20	Install the SIR Fuse. Are the repairs complete?	—	*Go to Step 29*	—
21	Inspect the SDM harness connector. Is the connector securely connected to the SDM?	—	*Go to Step 23*	*Go to Step 22*
22	1. Properly connect the SDM harness connector. 2. Install the CPA. Are the repairs complete?	—	*Go to Step 29*	—
23	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Check for proper connection to the SDM at terminal 10. Is the SDM harness connector terminal damaged or corroded?	—	*Go to Step 24*	*Go to Step 25*
24	Replace the SDM harness connector. Refer to *Wiring Repair* Are the repairs complete?	—	*Go to Step 29*	—
25	Inspect the SDM terminals for damage or corrosion. Are any terminals damaged or corroded?	—	*Go to Step 26*	*Go to Step 27*
26	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 22*	—
27	Measure the resistance from the SDM harness connector terminal 10 to each terminal of the SIR Fuse fuseholder. Is either resistance reading within the specified values?	0–5 Ω	Go to *SDM Integrity Check*	*Go to Step 29*
28	Repair an open condition in CKT 1139. Are the repairs complete?	—	*Go to Step 29*	—
29	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	Go to *SIR Diagnostic System Check*	—

DTC B1015 Passenger Deploy. Loop Resistance High



Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) perform tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds with the RESISTANCE MEASUREMENT test. During one portion of the RESISTANCE MEASUREMENT test, the SDM does the following:

- Grounds the PASSENGER SIDE LOW terminal 4 through an internal current sink.
- Connects the PASSENGER SIDE HIGH terminal 1 to an internal constant current source. This current produces proportional voltage drops in the deployment loop.
- Measures the voltage difference between PASSENGER SIDE HIGH and PASSENGER SIDE LOW.
- Calculates the resistance of the passenger deployment loop using the measured voltage.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The driver and passenger deployment loops are not shorted to voltage.
- The passenger deployment loop is not shorted to ground.
- The passenger deployment loop resistance is more than 3.0 ohms. The passenger deployment loop consists of the following components:
  - Inflatable restraint IP module.
  - Harness wiring of CKT 1403.
  - Harness wiring of CKT 1404.
  - Connector terminal contact.

The RESISTANCE MEASUREMENT test checks for this malfunction. This test only occurs once each ignition cycle when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC

  The resistance of the passenger deployment loop is less than 3.0 ohms and the ignition switch is cycled.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

When you issue a scan tool CLEAR CODES command and the malfunction is still present, the DTC will not reappear until the next ignition cycle.

Diagnostic Aids

A poor connection can cause an intermittent condition. Check the following for a poor connection:

- The inflatable restraint IP module harness connector terminals A and B.
- The SDM terminals 1 and 4.
- The wire to terminal connections in CKT 1403.
- The wire to terminal connections in CKT 1404.

The diagnostic table directs the technician to note the entry value of PASSENGER RESISTANCE. Comparing the value of PASSENGER RESISTANCE over multiple ignition cycles can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop resistance measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test checks for proper contact or corrosion of the yellow 2-way connector.
10. This test isolates the malfunction to one side of the inflatable restraint IP module yellow 2-way connector.
12. This test checks for proper contact or corrosion of the SDM connector.
17. This test determines whether the malfunction is in CKT 1403.
19. This test determines whether the malfunction is in CKT 1404.

DTC B1015 Passenger Deploy. Loop Resistance High

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Refer to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the passenger deployment loop resistance PASSENGER RESISTANCE. Has the PASSENGER RESISTANCE been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 3. Check for proper connection at terminals A and B on the IP harness side of the inflatable restraint IP module yellow 2-way connector. Are the terminals damaged or corroded?	—	*Go to Step 4*	*Go to Step 6*
4	Replace the inflatable restraint IP module yellow 2-way IP harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 5*	—
5	Check for proper connection at terminals A and B on the inflatable restraint IP module yellow 2-way jumper connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 21*
6	Check for proper connection at terminals A and B on the inflatable restraint IP module yellow 2-way connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 8*

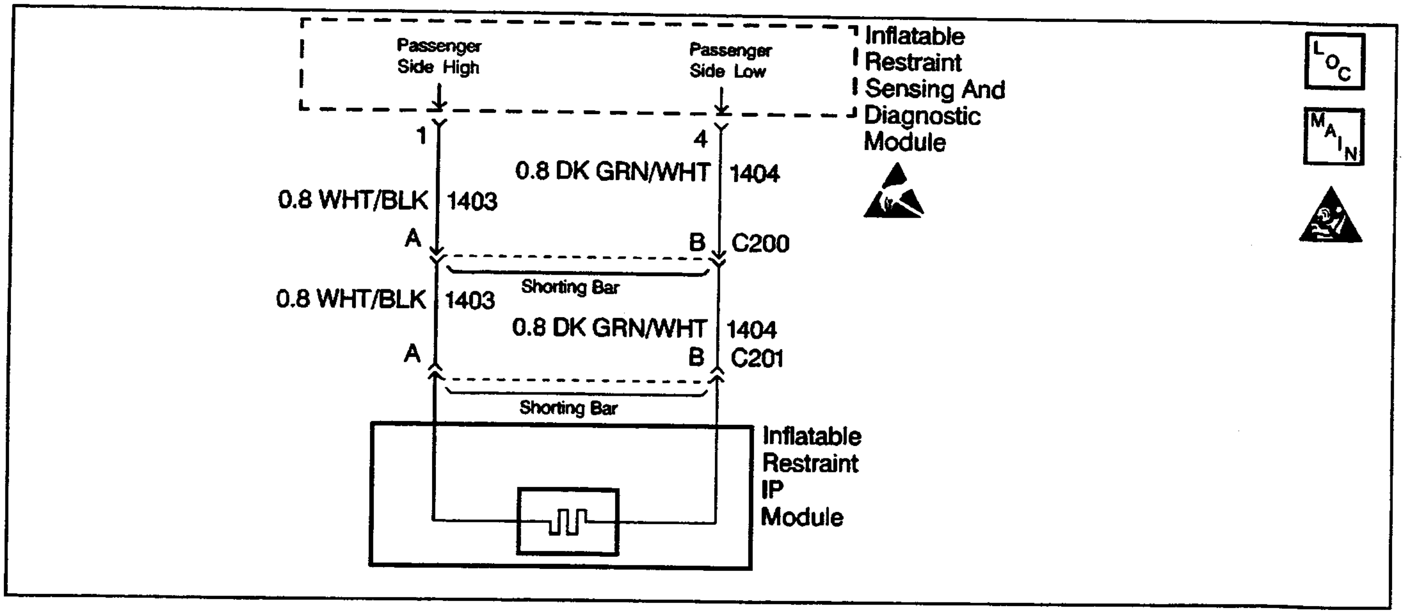
DTC B1015 Passenger Deploy. Loop Resistance High (cont'd)

Step	Action	Value(s)	Yes	No
7	Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 21*	—
8	1. Reconnect the yellow 2-way connectors near the base of the steering column and behind the glove box. 2. Turn the ignition switch to the ON position. 3. Using the scan tool, request the SIR data list display. 4. Read the passenger deployment loop resistance PASSENGER RESISTANCE. Is the passenger resistance more than the specified value?	3.0 Ω	*Go to Step 10*	*Go to Step 9*
9	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint IP module yellow 2-way IP harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 21*	—
10	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column. 3. Connect the *J 38715-A* SIR Driver/Passenger Load Tool to the connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the data list display. 6. Read the passenger deployment loop resistance PASSENGER RESISTANCE. Is the passenger resistance more than the specified value?	3.0 Ω	*Go to Step 12*	*Go to Step 11*
11	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Has the inflatable restraint IP module been replaced?	—	*Go to Step 21*	—
12	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Check for proper connection at terminals 1 and 4 on the SDM harness connector. Is the harness connector damaged or corroded?	—	*Go to Step 13*	*Go to Step 15*
13	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 14*	—
14	Check for proper connection at terminals 1 and 4 on the SDM. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 21*
15	Check for proper connection at terminals 1 and 4 on the SDM. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 17*

DTC B1015 Passenger Deploy. Loop Resistance High (cont'd)

Step	Action	Value(s)	Yes	No
16	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 21*	—
17	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance from the SDM harness connector terminal 1 to the inflatable restraint IP module yellow 2-way harness connector terminal A. Is the resistance reading within the specified values?	0–0.5 Ω	*Go to Step 19*	*Go to Step 18*
18	Repair the high resistance condition in CKT 1403. Are the repairs complete?	—	*Go to Step 21*	—
19	Measure the resistance from the SDM harness connector terminal 4 to the inflatable restraint IP module yellow 2-way harness connector terminal B. Is the resistance reading within the specified values?	0–0.5 Ω	Go to *SDM Integrity Check*	*Go to Step 20*
20	Repair the high resistance condition in CKT 1404. Are the repairs complete?	—	*Go to Step 21*	—
21	Reconnect all the SIR components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 22*	—
22	Clear all the SIR DTCs. Have all the DTCs been cleared?	—	Refer to *SIR Diagnostic System Check*	—

DTC B1016 Passenger Deployment Loop Resistance Low



190007

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds with the RESISTANCE MEASUREMENT test. During one portion of the RESISTANCE MEASUREMENT test, the SDM does the following:

- Grounds the PASSENGER SIDE LOW terminal 4 through an internal current sink.
- Connects the PASSENGER SIDE HIGH terminal 1 to an internal constant current source. This current produces proportional voltage drops in the deployment loop.
- Measures the voltage difference between PASSENGER SIDE HIGH and PASSENGER SIDE LOW.
- Calculates the resistance of the passenger deployment loop using the measured voltage.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The driver and passenger deployment loops are not shorted to voltage.
- The passenger deployment loop is not shorted to ground.
- The passenger deployment loop resistance is less than 1.4 ohms. The passenger deployment loop consists of the following components:
  - Inflatable restraint IP module.
  - Harness wiring of CKT 1403.
  - Harness wiring of CKT 1404.
  - Connector terminal contact.

The RESISTANCE MEASUREMENT test checks for this malfunction. This test only occurs once each ignition cycle when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a diagnostic trouble code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC

  The resistance of the passenger deployment loop is more than 1.4 ohm and the ignition switch is cycled.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

When you issue a scan tool CLEAR CODES command and the malfunction is still present, the DTC will not reappear until the next ignition cycle.

Diagnostic Aids

The following can cause an intermittent condition:

- A short circuit between CKT 1403 and CKT 347.
- A short circuit between CKT 1403 and CKT 348.
- A short circuit between CKT 1403 and CKT 1404.
- A malfunctioning shorting bar on the inflatable restraint IP module connector.

The diagnostic table directs the technician to note the entry value of PASSENGER RESISTANCE. Comparing the value of PASSENGER RESISTANCE over multiple ignition cycles can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop resistance measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
6. This test isolates the malfunction to one side of the inflatable restraint IP module yellow 2-way connector.
8. This test checks for a short from CKTs 1403 to 1404.
10. This test checks for a short from CKTs 1403 to 348.

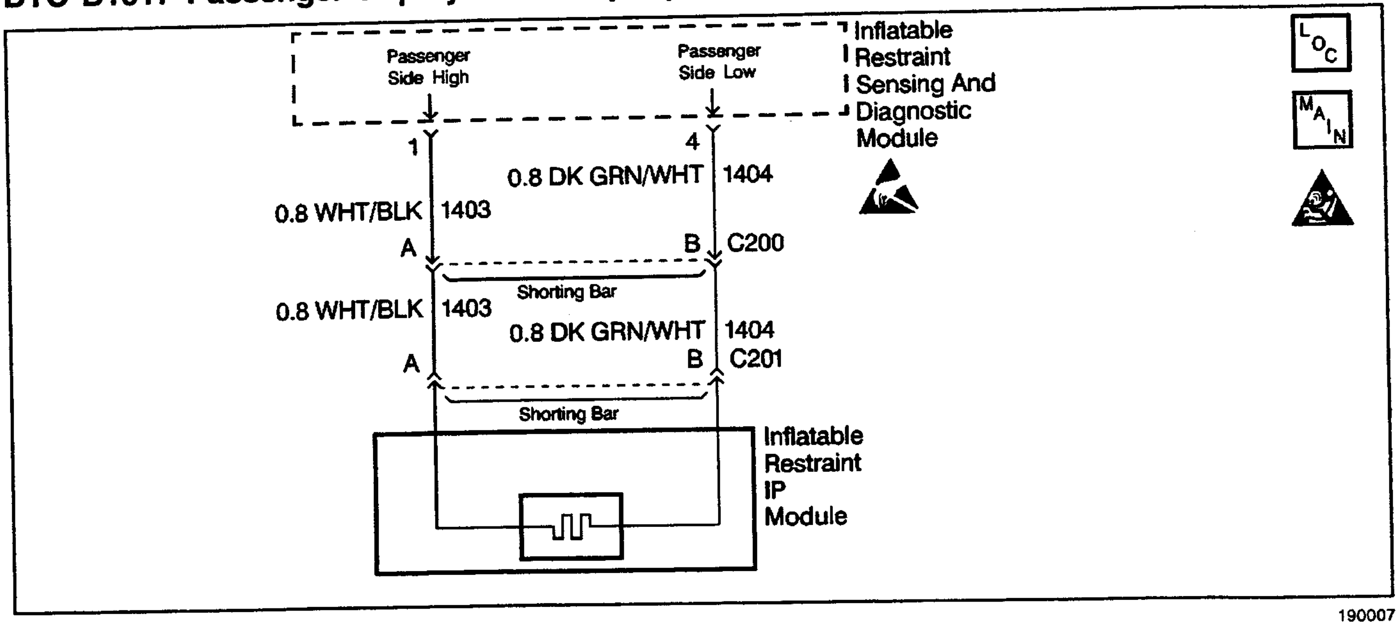
DTC B1016 Passenger Deployment Loop Resistance Low

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the passenger deployment loop resistance PASSENGER RESISTANCE. 6. Request the SIR DTC display. Is DTC B1022 also present?	—	*Go to Step 3*	*Go to Step 4*
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Repair the short from CKT 347 to CKT 1403. Are the repairs complete?	—	*Go to Step 12*	—
4	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint IP module yellow 2-way connector located behind the glove box. 3. Reconnect the 2-way connector. 4. Make sure that the CPA is properly installed. 5. Turn the ignition switch to the ON position. 6. Using a scan tool, request the SIR data list display. 7. Read the passenger deployment loop resistance PASSENGER RESISTANCE. Is PASSENGER RESISTANCE less than the specified value?	1.4 Ω	*Go to Step 6*	*Go to Step 5*
5	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint IP module yellow 2-way harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 12*	—

DTC B1016 Passenger Deployment Loop Resistance Low (cont'd)

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the passenger deployment loop resistance PASSENGER RESISTANCE. Is PASSENGER RESISTANCE less than the specified value?	1.4 Ω	*Go to Step 8*	*Go to Step 7*
7	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 12*	—
8	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect *J 38715-A.* 4. Zero the *J 39200.* 5. Measure the resistance from the SDM harness connector terminal 1 to terminal 4. Is the resistance less than the specified value?	OL	*Go to Step 9*	*Go to Step 10*
9	1. Turn the ignition switch to the OFF position. 2. Repair the short from CKT 1403 to CKT 1404. Are the repairs complete?	—	*Go to Step 12*	—
10	Measure the resistance from the SDM harness connector terminal 1 to terminal 3. Is the resistance less than the specified value?	OL	*Go to Step 11*	Go to *Infl Rst Instrument Panel Module Replacement*
11	Repair the short from CKT 1403 to CKT 348. Are the repairs complete?	—	*Go to Step 12*	—
12	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 13*	—
13	Clear the SIR DTCs.	—	Go to *SIR Diagnostic System Check*	—

DTC B1017 Passenger Deployment Loop Open


Passenger Side High
Passenger Side Low
Inflatable Restraint Sensing And Diagnostic Module
1
4
0.8 DK GRN/WHT
1404
0.8 WHT/BLK
1403
A
B
C200
Shorting Bar
0.8 WHT/BLK
1403
0.8 DK GRN/WHT
1404
A
B
C201
Shorting Bar
Inflatable Restraint IP Module
LOC
MAIN
190007

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 voltage to make sure it is within its respective normal voltage range. Then the SDM proceeds with the DEPLOYMENT LOOP CONTINUITY test. During the DEPLOYMENT LOOP CONTINUITY test, the SDM measures the voltage difference between PASSENGER SIDE HIGH and PASSENGER SIDE LOW.

Conditions for Setting the DTC

- The voltage difference between PASSENGER SIDE HIGH terminal 1 and PASSENGER SIDE LOW terminal 4 is more than or equal to 400 millivolts.
- The malfunction must be present for at least 500 milliseconds during one of the following tests:
  - DEPLOYMENT LOOP CONTINUITY

    If the malfunction is detected in this test, the RESISTANCE MEASUREMENT test will not be performed.
  - CONTINUOUS MONITORING

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC

  The voltage difference between PASSENGER SIDE HIGH terminal 1 and PASSENGER SIDE LOW terminal 4 is less than 400 millivolts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

The following can cause an intermittent condition:

- A poor connection at the inflatable restraint IP module harness connector terminals A and B.
- A poor connection at the SDM terminals 1 and 4.
- An open in CKT 1403.
- An open in CKT 1404.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop voltage difference measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test checks for proper contact or corrosion of the yellow 2-way connector.
10. This test isolates the malfunction to one side of the inflatable restraint IP module yellow 2-way connector.
12. This test checks for proper contact or corrosion of the SDM harness connector.
17. This test determines whether the malfunction is in CKT 1403.
19. This test determines whether the malfunction is in CKT 1404.

DTC B1017 Passenger Deployment Loop Open

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the passenger deployment loop voltage difference PASSENGER VDIF. Has the PASSENGER VDIF been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Check for proper connection at terminals A and B on the IP harness side of the inflatable restraint IP module yellow 2-way connector. Are the terminals damaged or corroded?	—	*Go to Step 4*	*Go to Step 6*
4	Replace the inflatable restraint IP module yellow 2-way IP harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 5*	—
5	Check for proper connection at terminals A and B on the inflatable restraint IP module yellow 2-way jumper connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 21*
6	Check for proper connection at terminals A and B on the inflatable restraint IP module yellow 2-way jumper connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 8*
7	Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 21*	—

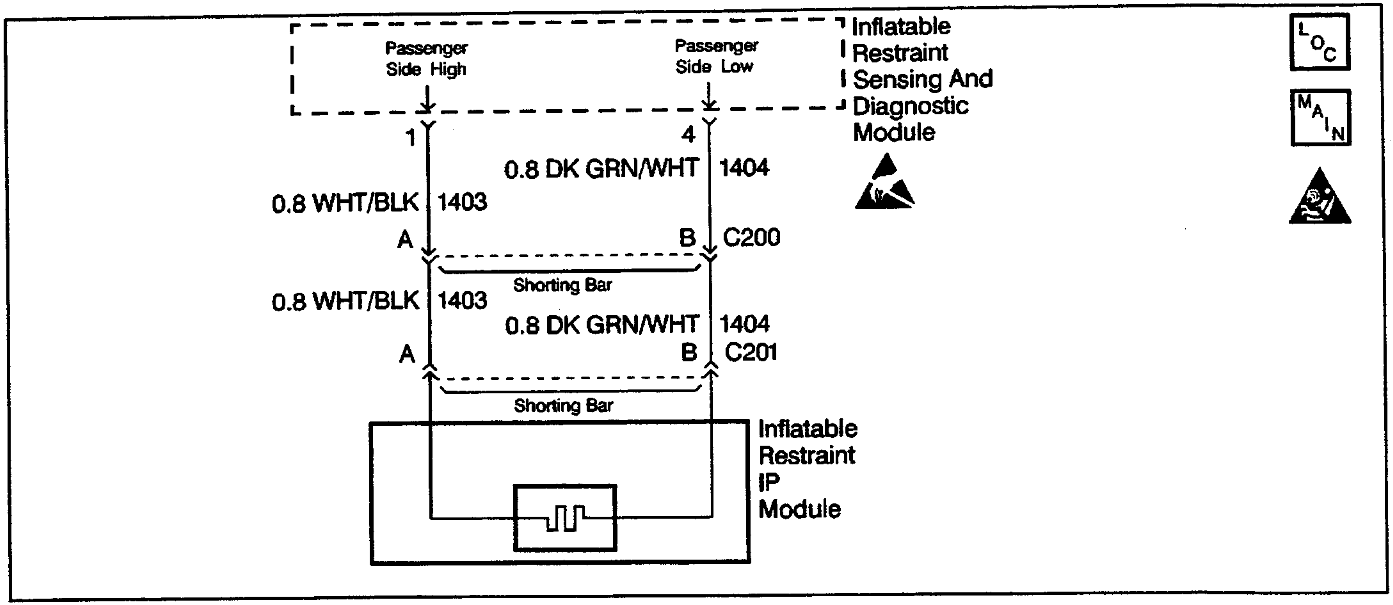
DTC B1017 Passenger Deployment Loop Open (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Connect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Turn the ignition switch to the ON position. 3. Using the scan tool, request the SIR data list display. 4. Read the passenger deployment loop voltage difference PASSENGER VDIF. Is the PASSENGER VDIF less than the specified value?	400 mV	*Go to Step 9*	*Go to Step 10*
9	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint IP module yellow 2-way IP harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 21*	—
10	1. Turn the ignition switch to the OFF position, 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 3. Connect the *J 38715-A* SIR Driver/Passenger Load Tool to the connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the data list display. 6. Read the passenger deployment loop voltage difference PASSENGER VDIF. Is the PASSENGER VDIF less than the specified value?	400 mV	*Go to Step 11*	*Go to Step 12*
11	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 21*	—
12	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Check for proper connection at terminals 1 and 4 on the SDM harness connector. Is the connector damaged or corroded?	—	*Go to Step 13*	*Go to Step 15*
13	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 14*	—
14	Check for proper connection at terminals 1 and 4 of the SDM. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 21*
15	Check for proper connection at terminals 1 and 4 of the SDM. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 17*
16	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 21*	—

DTC B1017 Passenger Deployment Loop Open (cont'd)

Step	Action	Value(s)	Yes	No
17	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance from the SDM harness connector terminal 1 to the inflatable restraint IP module yellow 2-way harness connector terminal A. Is the resistance reading within the specified values?	0–0.5 Ω	*Go to Step 19*	*Go to Step 18*
18	Repair the high resistance condition in CKT 1403. Are the repairs complete?	—	*Go to Step 21*	—
19	Measure the resistance from the SDM harness connector terminal 4 to the inflatable restraint IP module yellow 2-way harness connector terminal B. Is the resistance reading within the specified values?	0–0.5 Ω	Go to *SDM Integrity Check*	*Go to Step 20*
20	Repair the high resistance condition in CKT 1404. Are the repairs complete?	—	*Go to Step 21*	—
21	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 22*	—
22	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1018 Passenger Deployment Loop Short to GND



Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Upon passing these tests IGNITION 1, 23 VLR and the deployment loop voltages are measured to make sure they are within their respective normal voltage ranges. The SDM monitors the voltages at DRIVER SIDE LOW terminal 3 and PASSENGER SIDE LOW terminal 4 to detect shorts to ground in the inflator module circuits. The service wait time is 10 minutes. Refer to ENABLE/DISABLE procedures.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The driver deployment loop is not shorted to voltage.
- The voltage at DRIVER SIDE LOW terminal 3 is more than 3.3 volts.
- The voltage at PASSENGER SIDE LOW terminal 4 is less than 3.3 volts for 500 milliseconds.

The following tests check for this DTC. These tests occur when IGNITION 1 is within the normal operating voltage range.

- POWER-ON–When the malfunction is detected in this test, the RESISTANCE MEASUREMENT test will not be performed.
- CONTINUOUS MONITORING

Action Taken When the DTC Sets

- The SDM sets DTC B1018 and also DTC B1071.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

DTC B1018 is a latched code. You cannot clear a latched code. Repair the malfunction that set this DTC before you replace the SDM.

Diagnostic Aids

A short to ground in the inflatable restraint IP module circuit can cause an intermittent condition. A DTC B1018 would be accompanied by DTC B1071. Inspect CKT 1403 and CKT 1404 carefully for cutting or chafing. Wiring pigtail damage requires replacement of the inflatable restraint IP module. A careful inspection of the circuits and components indicated on the DTC B1018 table is essential in order to prevent damage to the replacement inflatable restraint Sensing and Diagnostic Module (SDM). The diagnostic table directs the technician to note the entry value of PASSENGER SENSELO. Comparing the value of PASSENGER SENSELO can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the passenger side low voltage measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test isolates the malfunction to one side of the inflatable restraint IP module yellow 2-way connector.
5. This test determines whether the malfunction is in CKT 1403.
7. This test determines whether the malfunction is in CKT 1404.

Notice: When DTC B1018 or B1024 has been set it is necessary to replace the inflatable restraint Sensing and Diagnostic Module (SDM). Setting DTC B1018 or B1024 will also cause DTC B1071 to set. When a scan tool clear codes command is issued and the malfunction is no longer present, DTC B1018 or B1024 and DTC B1071 will remain current. Make sure that the short to ground condition is repaired prior to installing a replacement SDM to avoid damaging the SDM.

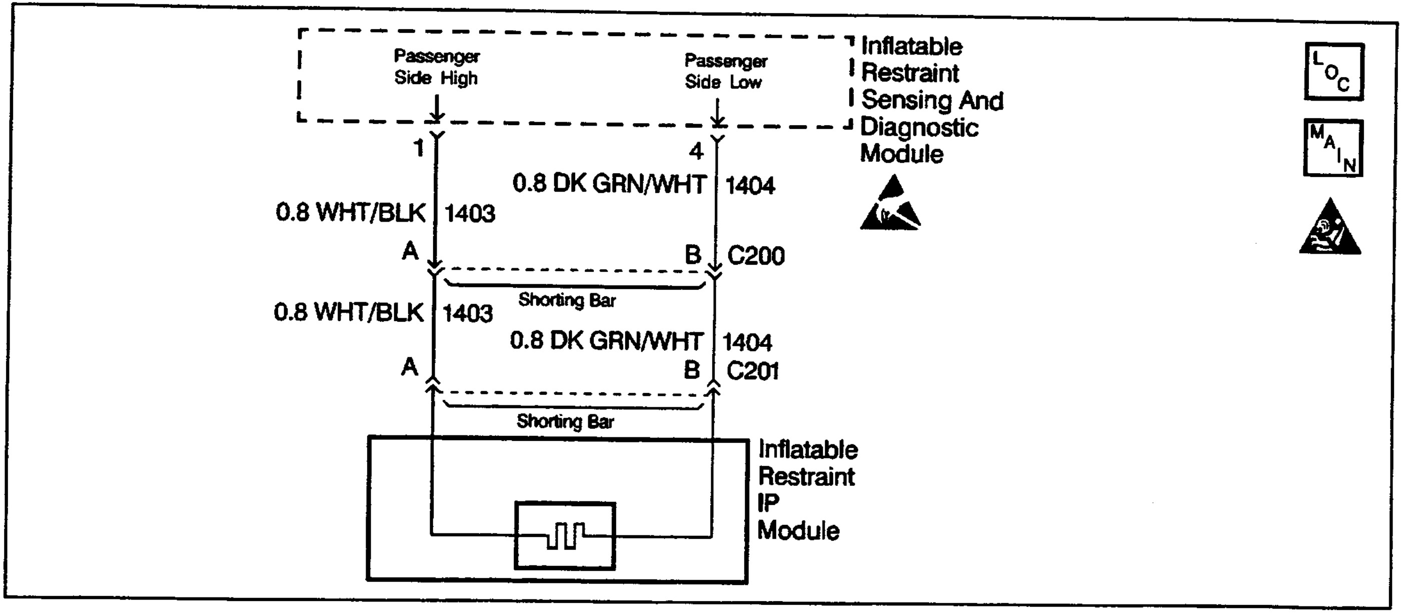
DTC B1018 Passenger Deployment Loop Short to GND

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the passenger side low voltage PASSENGER SENSELO. Has the PASSENGER SENSELO been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the passenger side low voltage PASSENGER SENSELO. Is PASSENGER SENSELO less than the specified value?	3.3 V	*Go to Step 5*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Inspect the inflatable restraint IP module pigtail for damage and proper routing. 3. Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 9*	—
5	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Zero the *J 39200* Digital Multimeter. 5. Measure the resistance on the SDM harness connector from terminals 1 to 6 (ground). Is the resistance less than the specified value?	OL	*Go to Step 6*	*Go to Step 7*

DTC B1018 Passenger Deployment Loop Short to GND (cont'd)

Step	Action	Value(s)	Yes	No
6	Repair a short to ground condition in CKT 1403. Are the repairs complete?	—	*Go to Step 9*	—
7	Measure the resistance on the SDM harness connector from terminals 4 to 6 (ground). Is the resistance less than the specified value?	OL	*Go to Step 8*	Go to *SDM Integrity Check*
8	Repair a short to ground condition in CKT 1404. Are the repairs complete?	—	*Go to Step 9*	—
9	1. Reconnect all the SIR system components, make sure all the components are properly mounted. 2. Turn the ignition switch to the ON position. 3. Make sure PASSENGER SENSELO is more than the specified value. 4. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Have all the SIR components been reconnected and properly mounted?	3.3 V	Go to *SIR Diagnostic System Check*	—

DTC B1019 Passenger Deploy. Loop Short to Voltage



190007

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Upon passing these tests IGNITION 1, 23 VLR and the deployment loop voltages are measured to make sure they are within their respective normal voltage ranges. The SDM monitors the voltages at DRIVER SIDE LOW terminal 3 and PASSENGER SIDE LOW terminal 4 to detect shorts to B+ in the inflator module circuits.

Conditions for Setting the DTC

- The voltage at DRIVER SIDE LOW terminal 3 is less than 4.8 volts.
- The voltage at PASSENGER SIDE LOW terminal 4 is more than 4.8 volts for 500 milliseconds.

The CONTINUOUS MONITORING test checks for this DTC. This test occurs when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC–The voltage at PASSENGER SIDE LOW terminal 4 is less than 4.8 volts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

A short to B+ in the inflatable restraint IP module circuit can cause an intermittent condition. Inspect CKT 1403 and CKT 1404 carefully for cutting or chafing. Wiring pigtail damage requires replacement of the inflatable restraint IP module. The diagnostic table directs the technician to note the entry value of PASSENGER SENSELO. Comparing the value of PASSENGER SENSELO can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

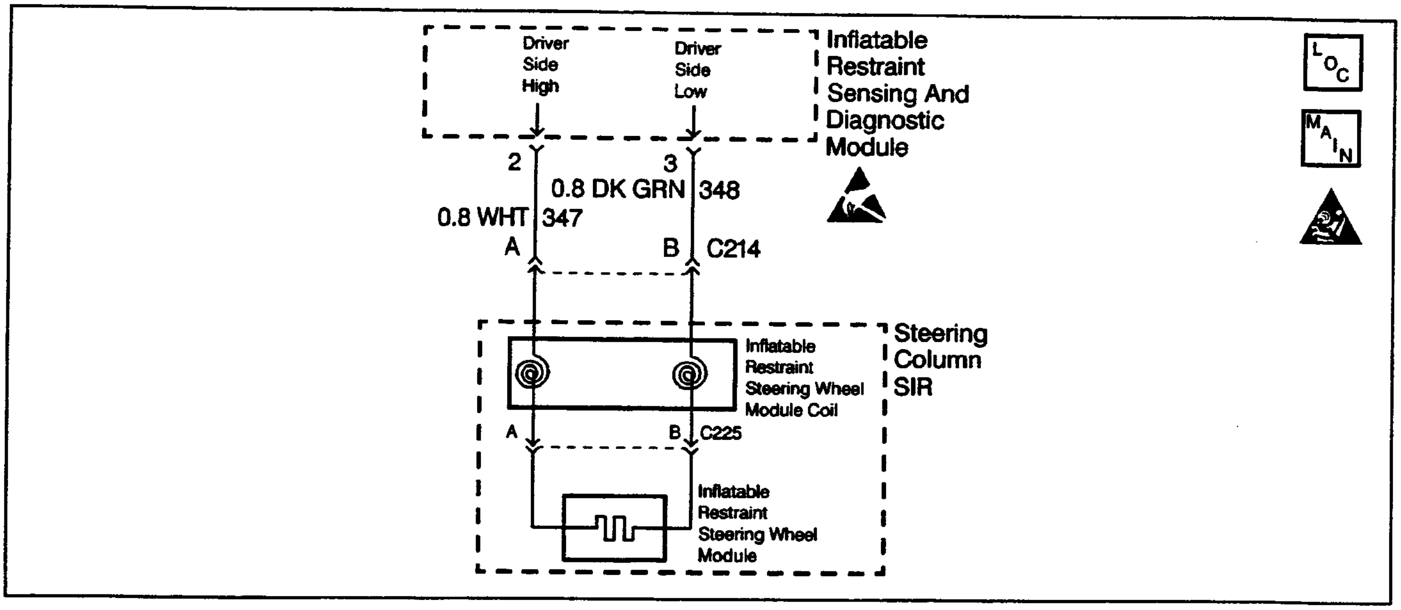
The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the passenger side low voltage measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test isolates the malfunction to one side of the inflatable restraint IP module yellow 2-way connector.
5. This test determines whether the malfunction is in CKT 1403.
7. This test determines whether the malfunction is in CKT 1404.

DTC B1019 Passenger Deploy. Loop Short to Voltage

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the passenger side low voltage PASSENGER SENSELO. Has the PASSENGER SENSELO been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the passenger side low voltage PASSENGER SENSELO. Is PASSENGER SENSELO more than the specified value?	4.8 V	*Go to Step 5*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Inspect the inflatable restraint IP module pigtail for damage and proper routing. 3. Replace the inflatable restraint IP module. Refer to *Infl Rst Instrument Panel Module Replacement.* Are the repairs complete?	—	*Go to Step 9*	—
5	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Turn the ignition switch to the ON position. 5. Zero the *J 39200* Digital Multimeter. 6. Measure the voltage on the SDM harness connector from terminal 1 to terminal 6 (ground). Is the measured voltage less than the specified value?	1.0 V	*Go to Step 7*	*Go to Step 6*
6	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 1403. Are the repairs complete?	—	*Go to Step 9*	—
7	Measure the voltage on the SDM harness connector from terminal 4 to terminal 6 (ground). Is the measured voltage less than the specified value?	1.0 V	Go to *SDM Integrity Check*	*Go to Step 8*
8	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 1404. Are the repairs complete?	—	*Go to Step 9*	—
9	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 10*	—
10	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1021 Driver Deployment Loop Resistance High


Driver Side High
Driver Side Low
Inflatable Restraint Sensing And Diagnostic Module
2
3
0.8 DK GRN 348
0.8 WHT 347
A
B
C214
Steering Column SIR
Inflatable Restraint Steering Wheel Module Coil
A
B
C225
Inflatable Restraint Steering Wheel Module
LOC
MAIN
208125

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds with the RESISTANCE MEASUREMENT test. During one portion of the RESISTANCE MEASUREMENT test, the SDM does the following:

- Grounds the DRIVER SIDE LOW terminal 3 through an internal current sink.
- Connects the DRIVER SIDE HIGH terminal 2 to an internal constant current source. This current produces proportional voltage drops in the deployment loop.
- Measures the voltage difference between DRIVER SIDE HIGH and DRIVER SIDE LOW.
- Calculates the resistance of the driver deployment loop using the measured voltage.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The driver and passenger deployment loops are not shorted to voltage.
- The driver deployment loop is not shorted to ground.
- The driver deployment loop resistance is more than 3.8 ohms. The driver deployment loop consists of the following components:
  - Inflatable restraint steering wheel module.
  - Inflatable restraint steering wheel module coil.
  - Harness wiring of CKT 347.
  - Harness wiring of CKT 348.
  - Connector terminal contact.

The RESISTANCE MEASUREMENT test checks for this malfunction. This test only occurs once each ignition cycle when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

The DTC will clear when one of the following conditions is met:

- Current DTC

  The resistance of the driver deployment loop is less than 3.8 ohms and the ignition switch is cycled.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

When you issue a scan tool CLEAR CODES command and the malfunction is still present, the DTC will not reappear until the next ignition cycle.

Diagnostic Aids

A poor connection can cause an intermittent condition. Check the following for a poor connection:

- The inflatable restraint steering wheel module steering column connector terminals A and B.
- The upper inflatable restraint steering wheel module coil connector terminals A and B.
- The SDM terminals 2 and 3.
- The wire to terminal connections in CKT 347.
- The wire to terminal connections in CKT 348.

The diagnostic table directs the technician to note the entry value of DRIVER RESISTANCE. Comparing the value of DRIVER RESISTANCE over multiple ignition cycles can be helpful in determining if an intermittent condition exist.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop resistance measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test checks for proper contact or corrosion of the yellow 2-way connector.
10. This test isolates the malfunction to one side of the inflatable restraint steering wheel module yellow 2-way connector.
11. This test determines whether the malfunction is due to the inflatable restraint steering wheel module or the module coil.
14. This test checks for proper contact or corrosion of the SDM connector.
19. This test determines whether the malfunction is in CKT 347.
21. This test determines whether the malfunction is in CKT 348.

DTC B1021 Driver Deployment Loop Resistance High

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the driver deployment loop resistance DRIVER RESISTANCE. Has the DRIVER RESISTANCE been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Check for proper connection at terminals A and B on the harness side of the inflatable restraint steering wheel module yellow 2-way connector at the base of the steering column. Are the terminals damaged or corroded?	—	*Go to Step 4*	*Go to Step 6*
4	Replace the yellow 2-way harness connector at the base of the steering column. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 5*	—
5	Check for proper connection at terminals A and B of the inflatable restraint steering wheel module coil side of the connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 23*
6	Check for proper connection at terminals A and B of the inflatable restraint steering wheel module coil side of the connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 8*

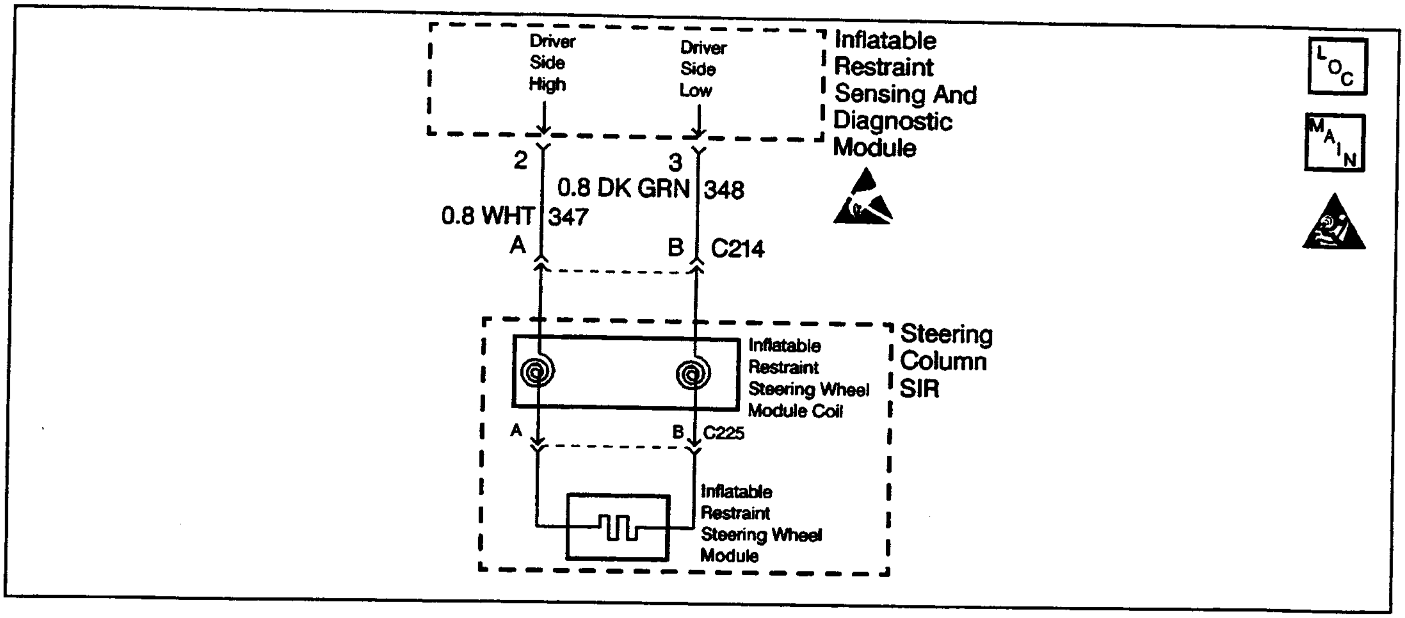
DTC B1021 Driver Deployment Loop Resistance High (cont'd)

Step	Action	Value(s)	Yes	No
7	Replace the inflatable restraint IP module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
8	1. Connect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Turn the ignition switch to the ON position. 3. Using the scan tool, request the SIR data list display. 4. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE more than the specified value?	3.8 Ω	*Go to Step 10*	*Go to Step 9*
9	1. Turn the ignition switch to the OFF position. 2. Replace the yellow 2-way harness connector at the base of the steering column. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 23*	—
10	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the harness connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the data list display. 6. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE more than the specified value?	3.8 Ω	*Go to Step 14*	*Go to Step 11*
11	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* 3. Disconnect *J 38715-A* from the driver 2-way connector. 4. Connect the 2-way connector. 5. Connect *J 38715-A* to the upper inflatable restraint steering wheel module coil connector on the steering column. 6. Turn the ignition switch to the ON position. 7. Using the scan tool, request the SIR data list display. 8. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE more than the specified value?	3.8 Ω	*Go to Step 13*	*Go to Step 12*
12	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* Are the repairs complete?	—	*Go to Step 23*	—

DTC B1021 Driver Deployment Loop Resistance High (cont'd)

Step	Action	Value(s)	Yes	No
13	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
14	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect *J 38715-A.* 4. Check for proper connection at terminal 2 and terminal 3 on the harness side of the SDM connector. Is the connector damaged or corroded?	—	*Go to Step 15*	*Go to Step 17*
15	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 16*	—
16	Check for proper connection at terminal 2 and terminal 3 on the SDM. Are the terminals damaged or corroded?	—	*Go to Step 18*	*Go to Step 23*
17	Check for proper connection at terminal 2 and terminal 3 on the SDM. Are the terminals damaged or corroded?	—	*Go to Step 18*	*Go to Step 19*
18	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
19	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance from the SDM harness connector terminal 2 to the inflatable restraint steering wheel module yellow 2-way harness connector terminal A. Is the resistance reading within the specified values?	0–0.5 Ω	*Go to Step 21*	*Go to Step 20*
20	Repair the high resistance condition in CKT 347. Are the repairs complete?	—	*Go to Step 23*	—
21	Measure the resistance from the SDM harness connector terminal 3 to the inflatable restraint steering wheel module yellow 2-way harness connector terminal B. Is the resistance reading within the specified values?	0–0.5 Ω	Go to *SDM Integrity Check*	*Go to Step 22*
22	Repair the high resistance condition in CKT 348. Are the repairs complete?	—	*Go to Step 23*	—
23	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 24*	—
24	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1022 Driver Deployment Loop Resistance Low


Driver Side High
Driver Side Low
Inflatable Restraint Sensing And Diagnostic Module
2
3
0.8 DK GRN
348
0.8 WHT
347
A
B
C214
Inflatable Restraint Steering Wheel Module Coil
Steering Column SIR
A
B
C225
Inflatable Restraint Steering Wheel Module
LOC
MAIN

208125

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds with the RESISTANCE MEASUREMENT test. During one portion of the RESISTANCE MEASUREMENT test, the SDM does the following:

- Grounds the DRIVER SIDE LOW terminal 3 through an internal current sink.
- Connects the DRIVER SIDE HIGH terminal 2 to an internal constant current source. This current produces proportional voltage drops in the deployment loop.
- Measures the voltage difference between DRIVER SIDE HIGH and DRIVER SIDE LOW.
- Calculates the resistance of the driver deployment loop using the measured voltage.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The driver and passenger deployment loops are not shorted to voltage.
- The driver deployment loop is not shorted to ground.
- The driver deployment loop resistance is less than 1.7 ohm. The driver deployment loop consists of the following components:
  - Inflatable restraint steering wheel module.
  - Inflatable restraint steering wheel module coil.
  - Harness wiring of CKT 347.
  - Harness wiring of CKT 348.
  - Connector terminal contact.

The RESISTANCE MEASUREMENT test checks for this malfunction. This test only occurs once each ignition cycle when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC—The resistance of the driver deployment loop is more than 1.7 ohm and the ignition switch is cycled.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

When you issue a scan tool CLEAR CODES command and the malfunction is still present, the DTC will not reappear until the next ignition cycle.

Diagnostic Aids

The following can cause an intermittent condition:

- A short circuit between CKT 347 and CKT 348.
- A short circuit between CKT 347 and CKT 1403.
- A short circuit between CKT 347 and CKT 1404.
- A malfunctioning shorting bar on the inflatable restraint steering wheel module connector.
- A malfunctioning shorting bar on the inflatable restraint steering wheel module coil steering column connector.

The diagnostic table directs the technician to note the entry value of DRIVER RESISTANCE. Comparing the value of DRIVER RESISTANCE over multiple ignition cycles can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop resistance measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
6. This test isolates the malfunction to one side of the inflatable restraint steering wheel module coil yellow 2-way connector.
7. This test determines whether the malfunction is due to the inflatable restraint steering wheel module or the module coil.
10. This test checks for a short from CKT 347 to CKT 348.
12. This test checks for a short from CKT 347 to CKT 1404.

DTC B1022 Driver Deployment Loop Resistance Low

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the driver deployment loop resistance DRIVER RESISTANCE. 6. Request the SIR DTC display. Is DTC B1016 also present?	—	*Go to Step 3*	*Go to Step 4*
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Repair the short from CKT 347 to CKT 1403. Are the repairs complete?	—	*Go to Step 14*	—

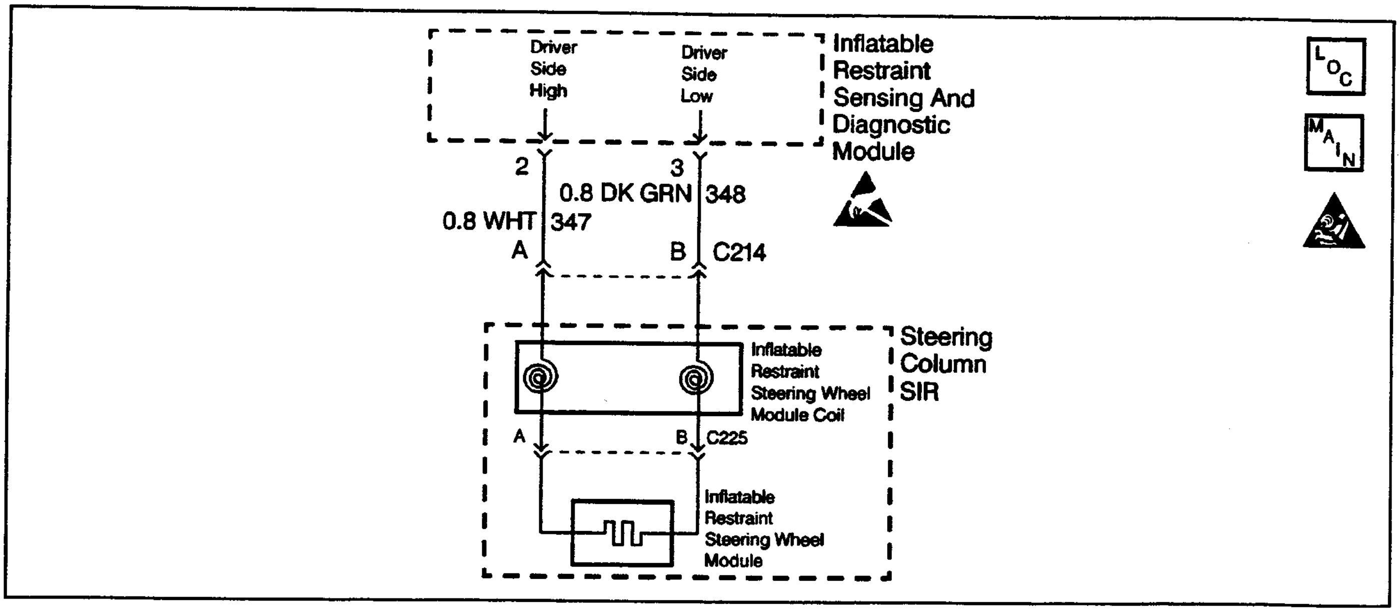
DTC B1022 Driver Deployment Loop Resistance Low (cont'd)

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel module yellow 2-way connector near the base of the steering column. 3. Reconnect the 2-way connector. 4. Inspect that the CPA is properly installed. 5. Turn the ignition switch to the ON position. 6. Using a scan tool, request the SIR data list display. 7. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE less than the specified value?	1.7 Ω	*Go to Step 6*	*Go to Step 5*
5	1. Turn the ignition switch to the OFF position. 2. Replace the yellow 2-way harness connector near the base of the steering column. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 14*	—
6	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the harness connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE less than the specified value?	1.7 Ω	*Go to Step 10*	*Go to Step 7*
7	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* 3. Disconnect *J 38715-A* from the driver 2-way connector. 4. Connect the 2-way connector at the base of the steering column. 5. Connect *J 38715-A* to the upper inflatable restraint steering wheel module coil connector on the steering column. 6. Turn the ignition switch to the ON position. 7. Using the scan tool, request the SIR data list display. 8. Read the driver deployment loop resistance DRIVER RESISTANCE. Is DRIVER RESISTANCE less than the specified value?	1.7 Ω	*Go to Step 9*	*Go to Step 8*
8	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* Are the repairs complete?	—	*Go to Step 14*	—

DTC B1022 Driver Deployment Loop Resistance Low (cont'd)

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 14*	—
10	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect *J 38715-A.* 4. Measure the resistance from the SDM harness connector terminal 2 to terminal 3. Is the resistance reading less than the specified value?	OL	*Go to Step 11*	*Go to Step 12*
11	Repair a short from CKT 347 to CKT 348. Are the repairs complete?	—	*Go to Step 14*	—
12	Measure the resistance from the SDM harness connector terminal 2 to terminal 4. Is the resistance reading less than the specified value?	OL	*Go to Step 13*	Go to *SDM Integrity Check*
13	Repair a short from CKT 347 to CKT 1404. Are the repairs complete?	—	*Go to Step 14*	—
14	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 15*	—
15	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1024 Driver Deployment Loop Short to Ground


Driver Side High
Driver Side Low
Inflatable Restraint Sensing And Diagnostic Module
2
3
0.8 DK GRN
348
0.8 WHT
347
A
B
C214
Inflatable Restraint Steering Wheel Module Coil
Steering Column SIR
A
B
C225
Inflatable Restraint Steering Wheel Module
LOC
MAIN

208125

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Upon passing these tests IGNITION 1, 23 VLR and the deployment loop voltages are measured to make sure they are within their respective normal voltage ranges. The SDM monitors the voltages at DRIVER SIDE LOW terminal 3 and PASSENGER SIDE LOW terminal 4 to detect shorts to ground in the inflator module circuits. The service wait time is 10 minutes. Refer to *Disabling the SIR System* or *Enabling the SIR System* procedures.

Conditions for Setting the DTC

- The driver and passenger deployment loops are not open.
- The passenger deployment loop is not shorted to voltage.
- The voltage at PASSENGER SIDE LOW terminal 4 is more than 3.3 volts.
- The voltage at DRIVER SIDE LOW terminal 3 is less than 3.3 volts for 500 milliseconds.

The following tests check for this DTC. These tests occur when IGNITION 1 is within the normal operating voltage range.

- POWER-ON–When the malfunction is detected in this test, the RESISTANCE MEASUREMENT test will not be performed.
- CONTINUOUS MONITORING

Action Taken When the DTC Sets

- The SDM sets DTC B1024 and also DTC B1071.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

DTC B1024 is a latched code. You cannot clear a latched code. Repair the malfunction that set this DTC before you replace the SDM.

Diagnostic Aids

A short to ground in the inflatable restraint steering wheel module circuit can cause an intermittent condition. A DTC B1024 would be accompanied by DTC B1071. Inspect CKT 347 and CKT 348 carefully for cutting or chafing. A careful inspection of the circuits and components indicated on the DTC B1024 table is essential in order to prevent damage to the replacement inflatable restraint Sensing and Diagnostic Module (SDM). The diagnostic table directs the technician to note the entry value of DRIVER SENSELO. Comparing the value of DRIVER SENSELO can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the driver side low voltage measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test isolates the malfunction to one side of the inflatable restraint steering wheel module coil yellow 2-way connector.
4. This test determines whether the malfunction is due to the inflatable restraint steering wheel module or the module coil.
7. This test determines whether the malfunction is in CKT 347.

Notice: When DTC B1018 or B1024 has been set it is necessary to replace the inflatable restraint Sensing and Diagnostic Module (SDM). Setting DTC B1018 or B1024 will also cause DTC B1071 to set. When a scan tool clear codes command is issued and the malfunction is no longer present, DTC B1018 or B1024 and DTC B1071 will remain current. Make sure that the short to ground condition is repaired prior to installing a replacement SDM to avoid damaging the SDM.

9. This test determines whether the malfunction is in CKT 348.

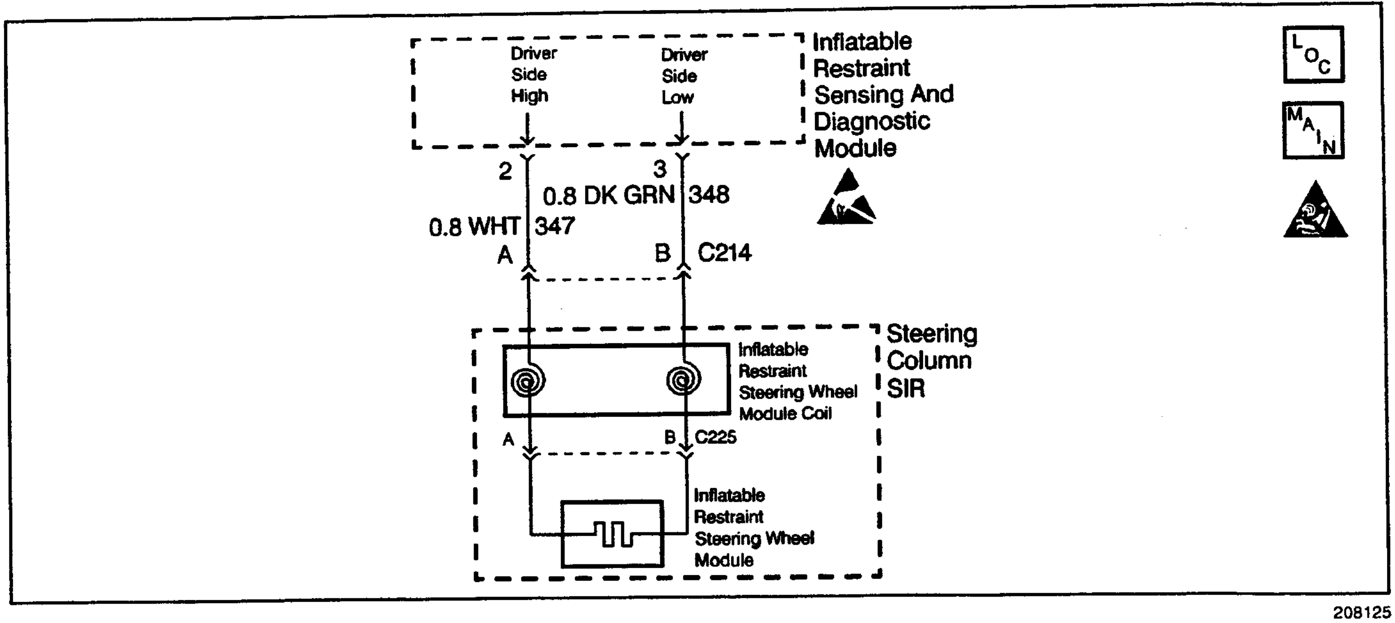
DTC B1024 Driver Deployment Loop Short to Ground

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the driver side low voltage DRIVER SENSELO. Has the DRIVER SENSELO been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the harness connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the driver side low voltage DRIVER SENSELO. Is DRIVER SENSELO less than the specified value?	3.3 V	*Go to Step 7*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* 3. Disconnect *J 38715-A* from the driver 2-way harness connector. 4. Connect the driver 2-way connector. 5. Connect *J 38715-A* to the upper inflatable restraint steering wheel module connector. 6. Turn the ignition switch to the ON position. 7. Using the scan tool, request the SIR data list display. 8. Read the driver side low voltage DRIVER SENSELO. Is DRIVER SENSELO less than the specified value?	3.3 V	*Go to Step 6*	*Go to Step 5*

DTC B1024 Driver Deployment Loop Short to Ground (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* Are the repairs complete?	—	*Go to Step 11*	—
6	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* 3. Inspect the coil and the wires for damage. 4. Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 11*	—
7	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Zero the *J 39200* Digital Multimeter. 5. Measure the resistance on the SDM harness connector from terminal 2 to terminal 6 (ground). Is the resistance reading less than the specified value?	OL	*Go to Step 8*	*Go to Step 9*
8	Repair a short to ground condition in CKT 347. Are the repairs complete?	—	*Go to Step 11*	—
9	Measure the resistance on the SDM harness connector from terminal 3 to terminal 6 (ground). Is the resistance reading less than the specified value?	OL	*Go to Step 10*	Go to *SDM Integrity Check*
10	Repair a short to ground condition in CKT 348. Are the repairs complete?	—	*Go to Step 11*	—
11	1. Reconnect all the SIR system components, make sure all the components are properly mounted. 2. Turn the ignition switch to the ON position. 3. Make sure that DRIVER SENSELO is more than the specified value. 4. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Have all the SIR components been reconnected and properly mounted?	3.3 V	Go to *SIR Diagnostic System Check*	—

DTC B1025 Driver Deployment Loop Short to Voltage


Driver Side High
Driver Side Low
Inflatable Restraint Sensing And Diagnostic Module
2
3
0.8 DK GRN 348
0.8 WHT 347
A
B
C214
Inflatable Restraint Steering Wheel Module Coil
Steering Column SIR
A
B
C225
Inflatable Restraint Steering Wheel Module
LOC
MAIN

208125

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Upon passing these tests IGNITION 1, 23 VLR and the deployment loop voltages are measured to make sure they are within their respective normal voltage ranges. The SDM monitors the voltages at DRIVER SIDE LOW terminal 3 and PASSENGER SIDE LOW terminal 4 to detect shorts to B+ in the inflator module circuits.

Conditions for Setting the DTC

- The voltage at PASSENGER SIDE LOW terminal 4 is less than 4.8 volts.
- The voltage at DRIVER SIDE LOW terminal 3 is more than 4.8 volts for 500 milliseconds.

The CONTINUOUS MONITORING test checks for this DTC. This test occurs when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC–The voltage at DRIVER SIDE LOW terminal 3 is less than 4.8 volts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

A short to B+ in the inflatable restraint steering wheel module circuit can cause an intermittent condition. Inspect CKT 347 and CKT 348 carefully for cutting or chafing. The diagnostic table directs the technician to note the entry value of DRIVER SENSELO. Comparing the value of DRIVER SENSELO can be helpful in determining if an intermittent condition exists.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the driver side low voltage measured by the inflatable restraint Sensing and Diagnostic Module (SDM).
3. This test isolates the malfunction to one side of the inflatable restraint steering wheel module coil yellow 2-way connector.
4. This test determines whether the malfunction is due to the inflatable restraint steering wheel module or the module coil.
7. This test determines whether the malfunction is in CKT 347.
9. This test determines whether the malfunction is in CKT 348.

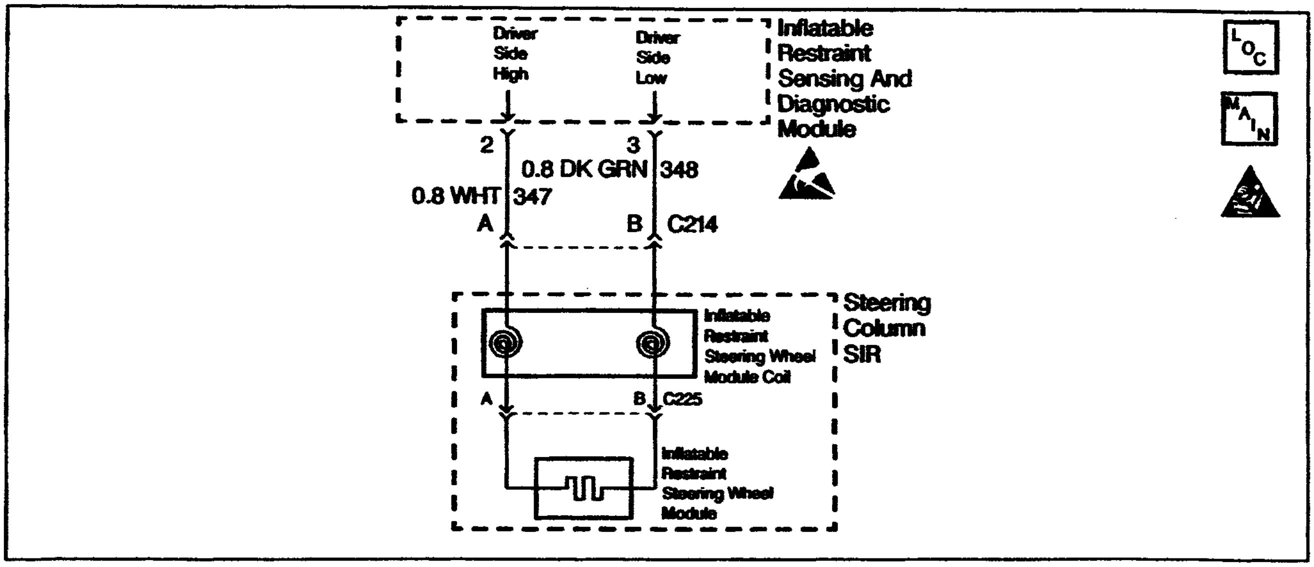
DTC B1025 Driver Deployment Loop Short to Voltage

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the driver side low voltage DRIVER SENSELO. Has the DRIVER SENSELO been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Connect *J 38715-A* SIR Driver/Passenger Load Tool to the harness connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the driver side low voltage DRIVER SENSELO. Is DRIVER SENSELO more than the specified value?	4.8 V	*Go to Step 7*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* 3. Disconnect *J 38715-A* from the driver 2-way harness connector. 4. Connect the driver 2-way connector. 5. Connect *J 38715-A* to the upper inflatable restraint steering wheel module connector. 6. Turn the ignition switch to the ON position. 7. Using the scan tool, request the SIR data list display. 8. Read the driver side low voltage DRIVER SENSELO. Is DRIVER SENSELO more than the specified value?	4.8 V	*Go to Step 6*	*Go to Step 5*
5	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* Are the repairs complete?	—	*Go to Step 11*	—
6	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* 3. Inspect the coil and the wires for damage. 4. Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 11*	—

DTC B1025 Driver Deployment Loop Short to Voltage (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Turn the ignition switch to the ON position. 5. Zero the *J 39200* Digital Multimeter. 6. Measure the voltage on the SDM harness connector from terminal 2 to terminal 6 (ground). Is the measured voltage less than the specified value?	1.0 V	*Go to Step 9*	*Go to Step 8*
8	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 347. Are the repairs complete?	—	*Go to Step 11*	—
9	Measure the voltage on the SDM harness connector from terminal 3 to terminal 6 (ground). Is the measured voltage less than the specified value?	1.0 V	Go to *SDM Integrity Check*	*Go to Step 10*
10	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 348. Are the repairs complete?	—	*Go to Step 11*	—
11	Reconnect all the SIR components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 12*	—
12	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1026 Driver Deployment Loop Open


Driver Side High
Driver Side Low
Inflatable Restraint Sensing And Diagnostic Module
2
3
0.8 DK GRN 348
0.8 WHT 347
A
B
C214
Steering Column SIR
Inflatable Restraint Steering Wheel Module Coil
A
B
C225
Inflatable Restraint Steering Wheel Module
LOC
MAIN

208125

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1 voltage to make sure it is within its respective normal voltage range. Then the SDM proceeds with the DEPLOYMENT LOOP CONTINUITY test. During the DEPLOYMENT LOOP CONTINUITY test, the SDM measures the voltage difference between DRIVER SIDE HIGH and DRIVER SIDE LOW.

Conditions for Setting the DTC

- The voltage difference between DRIVER SIDE HIGH terminal 2 and DRIVER SIDE LOW terminal 3 is more than or equal to 400 millivolts.
- The malfunction must be present for at least 500 milliseconds during one of the following tests:
  - DEPLOYMENT LOOP CONTINUITY

    If the malfunction is detected in this test, the RESISTANCE MEASUREMENT test will not be performed.
  - CONTINUOUS MONITORING

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC

  The voltage difference between DRIVER SIDE HIGH terminal 2 and DRIVER SIDE LOW terminal 3 is less than 400 millivolts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

The following can cause an intermittent condition:

- A poor connection at the inflatable restraint steering wheel module column connector terminals A and B.
- A poor connection at the upper inflatable restraint steering wheel coil connector terminals A and B.
- A poor connection at the SDM terminals 2 and 3.
- An open in CKT 347.
- An open in CKT 348.

An intermittent open in the inflatable restraint steering wheel module coil could also set this DTC. To test for a bad inflatable restraint steering wheel module coil, clear the DTCs, then turn the steering wheel back and forth with the ignition switch in the ON position. If the AIR BAG warning lamp comes ON and DTC B1026 has set again, it is likely the inflatable restraint steering wheel module coil is malfunctioning.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines the deployment loop voltage difference measured by the inflatable restraint sensing and diagnostic module.
3. This test checks for proper contact or corrosion of the yellow 2-way connector.
10. This test isolates the malfunction to one side of the inflatable restraint steering wheel module coil yellow 2-way connector.
11. This test determines whether the malfunction is due to the inflatable restraint steering wheel module or the module coil.
14. This test checks for proper contact or corrosion of the inflatable restraint sensing and diagnostic module connector.
19. This test determines whether the malfunction is in CKT 347.
21. This test determines whether the malfunction is in CKT 348.

DTC B1026 Driver Deployment Loop Open

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Connect a scan tool to the DLC. 3. Turn the ignition switch to the ON position. 4. Request the SIR data list display. 5. Read and record on the repair order the driver deployment loop voltage difference DRIVER VDIF. Has the DRIVER VDIF been read and recorded on the repair order?	—	*Go to Step 3*	—
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 3. Inspect for proper connection at terminals A and B on the harness side of the inflatable restraint steering wheel module yellow 2-way connector. Are the terminals damaged or corroded?	—	*Go to Step 4*	*Go to Step 6*
4	Replace the inflatable restraint steering wheel module yellow 2-way harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 5*	—
5	Check for proper connection at terminals A and B on the coil side of the connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 23*
6	Check for proper connection at terminals A and B on the coil side of the connector. Are the terminals damaged or corroded?	—	*Go to Step 7*	*Go to Step 8*
7	Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
8	1. Connect the 2-way harness connectors. 2. Turn the ignition switch to the ON position. 3. Using the scan tool, request the SIR data list display. 4. Read the driver deployment loop voltage difference DRIVER VDIF. Is the DRIVER VDIF less than the specified value?	400 mV	*Go to Step 9*	*Go to Step 10*

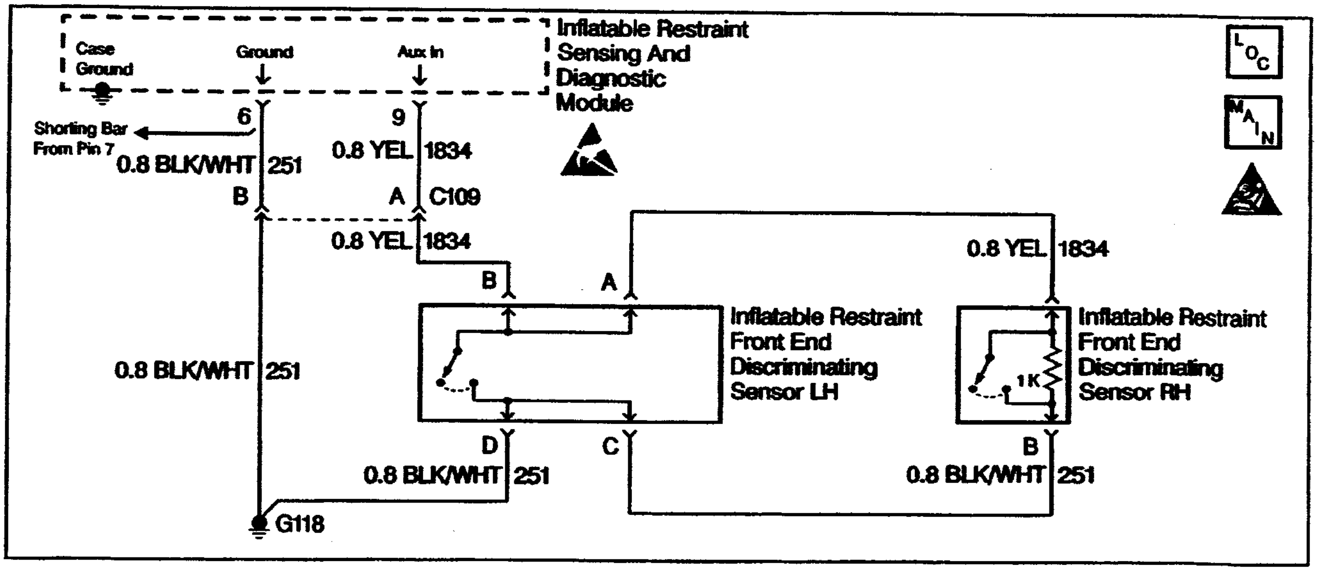
DTC B1026 Driver Deployment Loop Open (cont'd)

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module yellow 2-way harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 23*	—
10	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 3. Connect the *J 38715-A* SIR Driver/Passenger Load Tool to the harness connectors. 4. Turn the ignition switch to the ON position. 5. Using the scan tool, request the SIR data list display. 6. Read the driver deployment loop voltage difference DRIVER VDIF. Is the DRIVER VDIF less than the specified value?	400 mV	*Go to Step 11*	*Go to Step 14*
11	1. Turn the ignition switch to the OFF position. 2. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* 3. Disconnect the *J 38715-A* from the driver yellow 2-way harness connector. 4. Reconnect the driver yellow 2-way connector. 5. Connect the *J 38715-A* to the upper inflatable restraint steering wheel module coil. 6. Turn the ignition switch to the ON position. 7. Using the scan tool, request the SIR data list display. 8. Read the driver deployment loop voltage difference VDIF. Is the DRIVER VDIF less than the specified value?	400 mV	*Go to Step 12*	*Go to Step 13*
12	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
13	1. Turn the ignition switch to the OFF position. 2. Replace the inflatable restraint steering wheel module coil. Refer to *Infl Rst Steering Wheel Module Coil Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
14	1. Turn the ignition switch to the OFF position. 2. Disconnect the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Disconnect the *J 38715-A.* 4. Check for proper connection at terminals 2 and 3 on the harness side of the SDM connector. Is the connector damaged or corroded?	—	*Go to Step 15*	*Go to Step 17*

DTC B1026 Driver Deployment Loop Open (cont'd)

Step	Action	Value(s)	Yes	No
15	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 16*	—
16	Check for proper connection at terminals 2 and 3 of the SDM. Are the terminals damaged or corroded?	—	*Go to Step 18*	*Go to Step 23*
17	Check for proper connection at terminals 2 and 3 of the SDM. Are the terminals damaged or corroded?	—	*Go to Step 18*	*Go to Step 19*
18	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 23*	—
19	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance from the SDM harness connector terminal 2 to the inflatable restraint steering wheel module yellow 2-way harness connector terminal A. Is the resistance reading within the specified values?	0-0.5 Ω	*Go to Step 21*	*Go to Step 20*
20	Repair the high resistance condition in CKT 347. Are the repairs complete?	—	*Go to Step 23*	—
21	Measure the resistance from the SDM harness connector terminal 3 to the inflatable restraint steering wheel module yellow 2-way harness connector terminal B. Is the resistance reading within the specified values?	0-0.5 Ω	Go to *SDM Integrity Check*	*Go to Step 22*
22	Repair the high resistance condition in CKT 348. Are the repairs complete?	—	*Go to Step 23*	—
23	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 24*	—
24	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1035 Discr. Sensor Closed or Short to GND


Case Ground
Ground
Aux In
Inflatable Restraint Sensing And Diagnostic Module
Shorting Bar From Pin 7
6
9
0.8 BLK/WHT 251
0.8 YEL 1834
B
A
C109
0.8 YEL 1834
B
A
0.8 YEL 1834
Inflatable Restraint Front End Discriminating Sensor LH
Inflatable Restraint Front End Discriminating Sensor RH
1K
0.8 BLK/WHT 251
D
C
B
0.8 BLK/WHT 251
0.8 BLK/WHT 251
G118
LOC
MAIN

211724

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1, 23 VLR and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds to CONTINUOUS MONITORING. The SDM contains a resistor network connected to 5 volts, ground, and to the SDM front-end sensor signal terminal 9. The SDM monitors two front end discriminating sensors that are wired in parallel. The 1.0 K ohm resistor in the RH inflatable restraint front end discriminating sensor parallel to the normally open switches in both sensors and provides a parallel path to ground. This causes a specified percentage of voltage to appear at the SDM front-end sensor signal input. The SDM monitors this voltage to detect shorts to ground or a closed discriminating sensor.

Conditions for Setting the DTC

- The SDM is configured for an inflatable restraint front end discriminating sensor
- The voltage at front-end sensor signal terminal 9 is less than 0.5 volts for 500 milliseconds.

The CONTINUOUS MONITORING test checks for this DTC. This test occurs when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC–The voltage at front-end sensor signal terminal 9 is more than 2.4 volts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

A short to ground in the inflatable restraint front end discriminating sensor circuit can cause an intermittent condition. Inspect CKT 1834 carefully for cutting or chafing.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

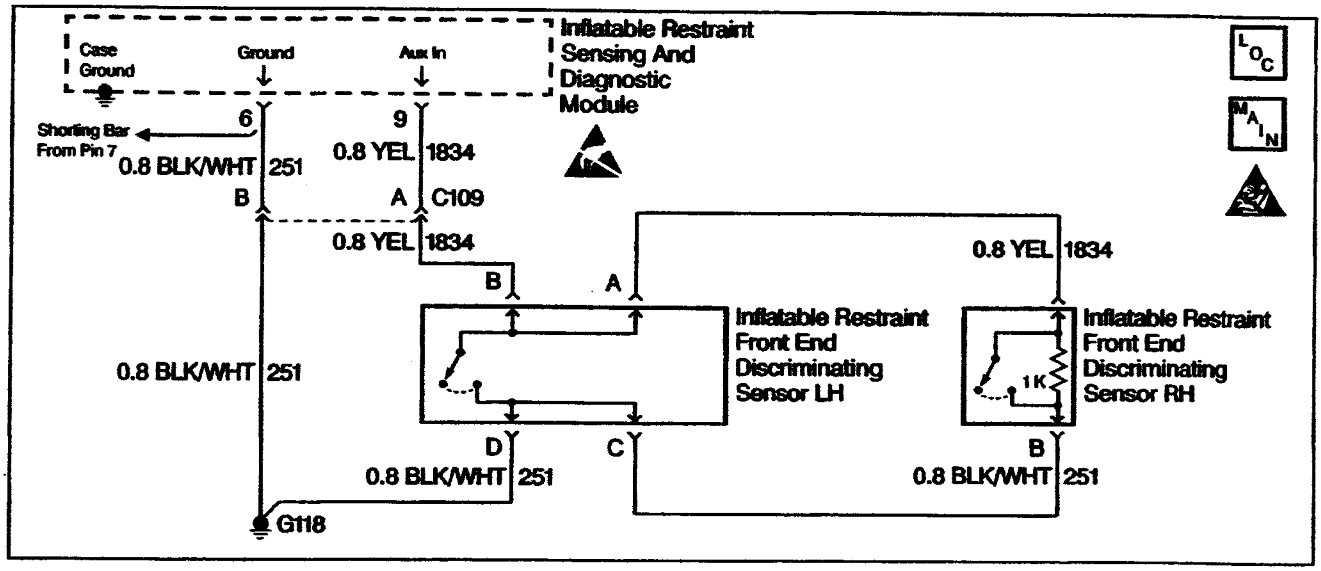
The numbers below refer to the step numbers on the diagnostic table:

2. This test checks for a malfunctioning discriminating sensor.
7. This test checks for a short to ground in CKT 1834.
8. This test isolates the short to ground in CKT 1834 to one side of C109.

DTC B1035 Discr. Sensor Closed or Short to GND

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the RH inflatable restraint front end discriminating sensor. 3. Zero the *J 39200* Digital Multimeter. 4. Measure the resistance between the sensor terminals A and B. Is the resistance reading more than the specified value?	950 Ω	*Go to Step 3*	*Go to Step 6*
3	1. Disconnect the LH inflatable restraint front end discriminating sensor. 2. Measure the resistance between the sensor terminals B and D. Is the resistance reading less than the specified value?	OL	*Go to Step 6*	*Go to Step 4*
4	With both sensors disconnected, measure the resistance between either sensor harness connector terminal A and ground. Is the resistance reading less than the specified value?	OL	*Go to Step 5*	*Go to Step 7*
5	Repair a short to ground condition in CKT 1834 between the two front end discriminating sensor harness connectors. Are the repairs complete?	—	*Go to Step 11*	—
6	Replace the malfunctioning inflatable restraint front end discriminating sensor. Refer to *Infl Rst Front End Discriminating Sensor Replace.* Are the repairs complete?	—	*Go to Step 11*	—
7	1. Disconnect the inflatable restraint Sensing and Diagnostic Module (SDM). Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Measure the resistance from the sensor harness connector terminal B to ground. Is the resistance reading less than the specified value?	OL	*Go to Step 8*	Go to *SDM Integrity Check*
8	1. Disconnect C109. Refer to SIR Component Location. 2. Measure the resistance from the sensor harness connector terminal B to ground. Is the resistance reading less than the specified value?	OL	*Go to Step 9*	*Go to Step 10*
9	Repair a short to ground condition in CKT 1834 between C109 and the sensor harness connector. Are the repairs complete?	—	*Go to Step 11*	—
10	Repair a short to ground condition in CKT 1834 between C109 and the SDM harness connector. Are the repairs complete?	—	*Go to Step 11*	—
11	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 12*	—
12	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1036 Discr. Sensor Open or Short to Voltage



Inflatable Restraint Sensing And Diagnostic Module
Case Ground
Ground
Aux In
6
9
Shorting Bar From Pin 7
0.8 BLK/WHT 251
0.8 YEL 1834
B
A
C109
0.8 YEL 1834
B
A
Inflatable Restraint Front End Discriminating Sensor LH
0.8 YEL 1834
Inflatable Restraint Front End Discriminating Sensor RH
1K
0.8 BLK/WHT 251
D
C
B
0.8 BLK/WHT 251
0.8 BLK/WHT 251
G118

211724

Circuit Description

When you first turn the ignition switch to the ON position, the inflatable restraint Sensing and Diagnostic Module (SDM) performs tests to diagnose critical malfunctions within itself. Next the SDM measures IGNITION 1, 23 VLR and the deployment loop voltages to make sure they are within their respective normal voltage ranges. Then the SDM proceeds to CONTINUOUS MONITORING. The SDM contains a resistor network connected to 5 volts, ground, and to the SDM front-end sensor signal terminal 9. The SDM monitors two front end discriminating sensors that are wired in parallel. The 1.0 K ohm resistor in the RH inflatable restraint front end discriminating sensor parallel to the normally open switches in both sensors and provides a parallel path to ground. This causes a specified percentage of voltage to appear at the SDM front-end sensor signal input. The SDM monitors this voltage to detect shorts to power or an open discriminating sensor.

Conditions for Setting the DTC

- The SDM is configured for an inflatable restraint front end discriminating sensor
- The voltage at front-end sensor signal terminal 9 is more than 5.0 volts for 500 milliseconds.

The CONTINUOUS MONITORING test checks for this DTC. This test occurs when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC–The voltage at front-end sensor signal terminal 9 is less than 3.2 volts for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

A broken or chafed wire in the inflatable restraint front end discriminating sensor circuit can cause an intermittent condition. Inspect CKT 1834 and CKT 251 carefully for cutting or chafing.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test checks for proper contact or corrosion of the yellow 2-way connector.
7. This test checks for a malfunctioning discriminating sensor.
8. This test checks for an open in CKT 251.
18. This test checks for proper contact or corrosion of the inflatable restraint Sensing and Diagnostic Module (SDM) connector.
23. This test checks for an open in CKT 1834.
33. This test isolates the open in CKT 1834 to one side of C109
36. This test checks for a short to voltage in CKT 1834.

DTC B1036 Discr. Sensor Open or Short to Voltage

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the RH inflatable restraint front end discriminating sensor. 3. Check for proper connection at the sensor harness connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 3*	*Go to Step 5*
3	Replace the sensor harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 4*	—
4	Check for proper connection at the RH sensor connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 6*	*Go to Step 36*
5	Check for proper connection at the RH sensor connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 6*	*Go to Step 7*
6	Replace the RH inflatable restraint front end discriminating sensor. Refer to *Infl Rst Front End Discriminating Sensor Replace.* Are the repairs complete?	—	*Go to Step 36*	—
7	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance between the RH sensor connector terminals A and B. Is the resistance reading more than the specified value?	1050 Ω	*Go to Step 6*	*Go to Step 8*
8	Measure the resistance from the RH sensor harness connector terminal B to ground. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 18*	*Go to Step 9*
9	1. Disconnect the LH sensor. 2. Check for proper connection at the LH sensor harness connector terminals C and D. Are the terminals damaged or corroded?	—	*Go to Step 10*	*Go to Step 12*
10	Replace the LH sensor connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 11*	—
11	Check for proper connection at the LH sensor connector terminals C and D. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 38*
12	Check for proper connection at the LH sensor connector terminals C and D. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 13*
13	Measure the resistance between the RH sensor harness connector terminal B and the LH sensor harness connector terminal C. the resistance reading within the specified values?	0–5 Ω	*Go to Step 15*	*Go to Step 14*
14	Repair an open condition in CKT 251 between the two sensors. Are the repairs complete?	—	*Go to Step 38*	—

DTC B1036 Discr. Sensor Open or Short to Voltage (cont'd)

Step	Action	Value(s)	Yes	No
15	Measure the resistance between the LH sensor harness connector terminal D and ground. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 16*	*Go to Step 17*
16	Replace the LH inflatable restraint front end discriminating sensor. Refer to *Infl Rst Front End Discriminating Sensor Replace.* Are the repairs complete?	—	*Go to Step 38*	—
17	Repair an open condition in CKT 251 between the LH inflatable restraint front end discriminator sensor harness connector and ground. Are the repairs complete?	—	*Go to Step 38*	—
18	1. Disconnect the inflatable restraint Sensing and Diagnostic Module (SDM). Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 2. Check for proper connection at terminal 9 on the harness side of the SDM connector. Is the connector damaged or corroded?	—	*Go to Step 19*	*Go to Step 21*
19	Replace the SDM harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 20*	—
20	Check for proper connection at terminal 9 of the SDM. Is the terminal damaged or corroded?	—	*Go to Step 22*	*Go to Step 38*
21	Check for proper connection at terminal 9 of the SDM. Is the terminal damaged or corroded?	—	*Go to Step 22*	*Go to Step 23*
22	Replace the inflatable restraint Sensing and Diagnostic Module (SDM). Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 38*	—
23	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and the IP module yellow 2-way connector located behind the glove box. 2. Reconnect the LH Discriminating Sensor. 3. Measure the resistance between the RH sensor harness connector terminal A and the SDM harness connector terminal 9. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 36*	*Go to Step 24*
24	1. Disconnect the LH sensor. 2. Check for proper connection at the LH sensor harness connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 25*	*Go to Step 27*
25	Replace the LH sensor harness connector. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 26*	—
26	Check for proper connection at the LH sensor connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 38*

DTC B1036 Discr. Sensor Open or Short to Voltage (cont'd)

Step	Action	Value(s)	Yes	No
27	Check for proper connection at the LH sensor connector terminals A and B. Are the terminals damaged or corroded?	—	*Go to Step 16*	*Go to Step 28*
28	Measure the resistance between the SDM harness connector terminal 9 and the LH sensor harness connector terminal B. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 29*	*Go to Step 31*
29	Measure the resistance between the LH sensor harness connector terminal A and the RH sensor harness connector terminal A. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 16*	*Go to Step 30*
30	Repair an open condition in CKT 1834 between the two sensors. Are the repairs complete?	—	*Go to Step 38*	—
31	1. Disconnect C109. Refer to SIR Component Location. 2. Check for proper connection at C109 terminal A. Is the terminal damaged or corroded?	—	*Go to Step 32*	*Go to Step 33*
32	Replace C109. Refer to *Wiring Repair.* Are the repairs complete?	—	*Go to Step 38*	—
33	Measure the resistance between the LH sensor harness connector terminal B and the C109 terminal A. Is the resistance reading within the specified values?	0–5 Ω	*Go to Step 34*	*Go to Step 35*
34	Repair an open condition in CKT 1834 between C109 and the SDM harness connector. Are the repairs complete?	—	*Go to Step 38*	—
35	Repair an open condition in CKT 1834 between C109 and the sensor harness connector. Are the repairs complete?	—	*Go to Step 38*	—
36	1. Turn the ignition switch to the ON position. 2. Measure the voltage on the sensor harness connector from terminal A to ground. Is the measured voltage less than the specified value?	1.0 V	Go to *SDM Integrity Check*	*Go to Step 37*
37	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 1834. Are the repairs complete?	—	*Go to Step 38*	—
38	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 39*	—
39	Clear all the SIR DTCs. Have all the SIR DTCs been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1051 Deployment Commanded

Circuit Description

The inflatable restraint Sensing and Diagnostic Module (SDM) contains a sensing device that converts vehicle velocity changes to an electrical signal. The SDM processes the generated electrical signal and compares it to a value stored in memory. When the generated signal exceeds the stored value, the SDM performs additional signal processing and compares the generated signals to signals stored in memory. When two of the generated signals exceed the stored values, the SDM will cause current to flow through the inflator modules, deploying the air bags and causing DTC B1051 to set.

Conditions for Setting the DTC

The SDM detects a frontal crash, up to 30 degrees off the centerline of the vehicle, of sufficient force to warrant deployment of the air bags.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.
- The SDM records crash data.

Conditions for Clearing the DTC

DTC B1051 is a latched code. You cannot clear a latched code. Replace the SDM after following the instructions in the diagnostic table.

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. If the inflator module(s) has not deployed, DTC B1051 may have set falsely.
3. If DTC B1051 has set with no signs of frontal impact, the DTC has set falsely.

DTC B1051 Deployment Commanded

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	Turn the ignition switch to the OFF position. Has the inflator module(s) deployed?	—	*Go to Step 5*	*Go to Step 3*
3	Inspect the front of the vehicle and the undercarriage for signs of impact. Are there signs of impact?	—	*Go to Step 5*	*Go to Step 4*
4	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 6*	—
5	Replace components and perform inspections as required following an accident. Refer to *Repairs and Inspections Required After an Accident.* Have the appropriate inspections and repairs been made?	—	*Go to Step 6*	—
6	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	Go to *SIR Diagnostic System Check*	—

DTC B1053 Deployment Commanded w/Loop Malfunction

Circuit Description

The inflatable restraint Sensing and Diagnostic Module (SDM) contains a sensing device that converts vehicle velocity changes to an electrical signal. The SDM processes the generated electrical signal and compares it to a value stored in memory. When the generated signal exceeds the stored value, the SDM performs additional signal processing and compares the generated signals to signals stored in memory. When two of the generated signals exceed the stored values, the SDM will cause current to flow through the inflator modules, deploying the air bags. DTC B1053 will set instead of a DTC B1051 when a deployment occurs while an inflator circuit fault is present that could possibly result in a non-deployment situation in one or both inflator modules.

Conditions for Setting the DTC

The SDM detects a frontal crash, up to 30 degrees off the centerline of the vehicle, of sufficient force to warrant deployment of the air bags.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.
- The SDM records crash data.

Conditions for Clearing the DTC

DTC B1053 is a latched code. You cannot clear a latched code. Replace the SDM after following the instructions in the diagnostic table.

Diagnostic Aids

DTC B1053 will be accompanied by another DTC (other than DTC B1071). Repair the malfunction causing the other DTCs before installing a new SDM.

Test Description

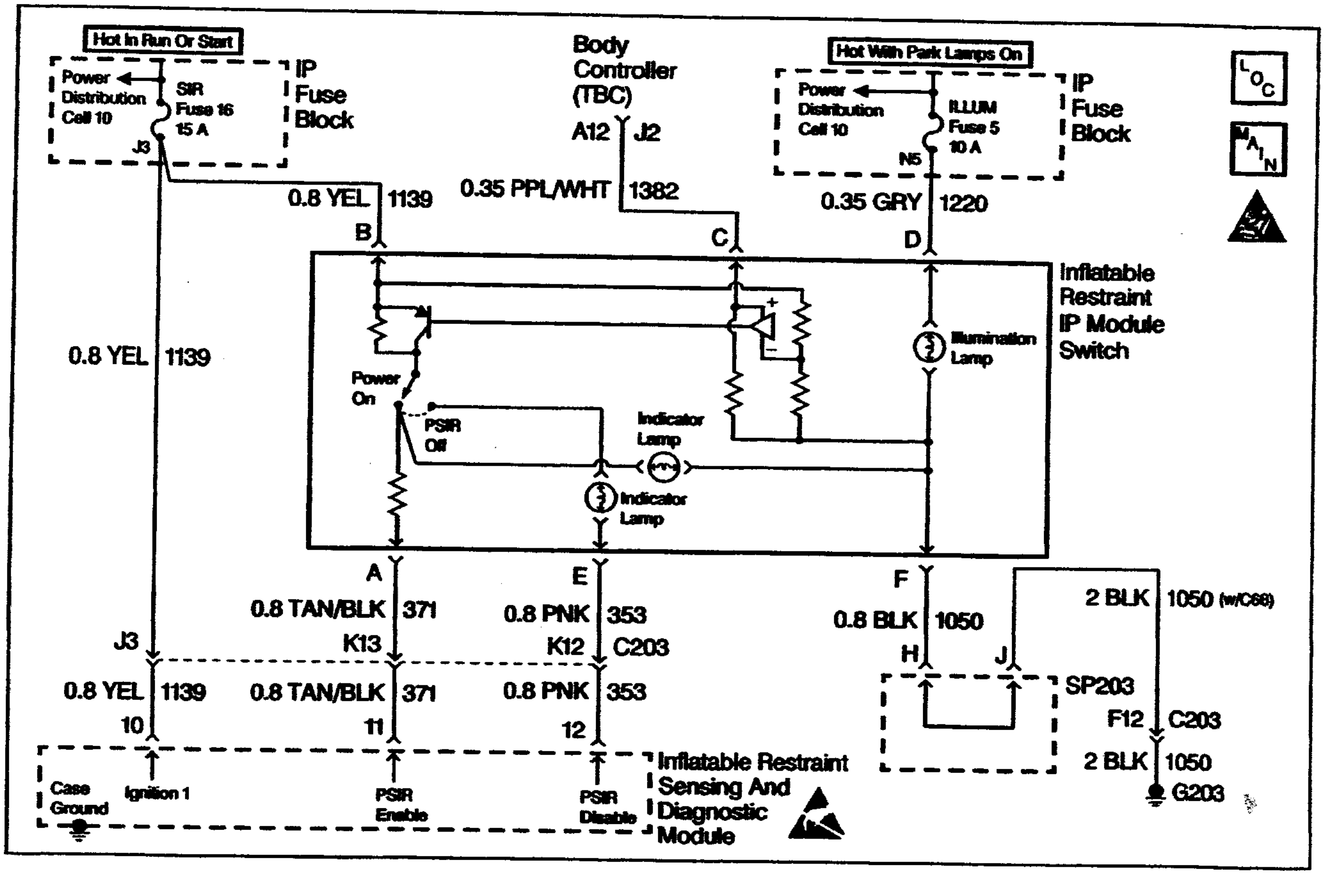
The numbers below refer to the step numbers on the diagnostic table:

2. If the inflator module(s) has not deployed, DTC B1053 may have set falsely.
3. If DTC B1053 has set with no signs of frontal impact, the DTC has set falsely.

DTC B1053 Deployment Commanded w/Loop Malfunction

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	Turn the ignition switch to the OFF position. Has the inflator modules deployed?	—	*Go to Step 5*	*Go to Step 3*
3	Inspect the front of the vehicle and the undercarriage for signs of impact. Are there signs of impact?	—	*Go to Step 5*	*Go to Step 4*
4	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	*Go to Step 6*	—
5	Replace components and perform inspections as required following an accident. Refer to *Repairs and Inspections Required After an Accident.* Have the appropriate inspections and repairs been made?	—	*Go to Step 6*	—
6	Reconnect all the SIR system components, make sure all the components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	Go to *SIR Diagnostic System Check*	—

DTC B1054 Infl Rst IP Module Switch CKT Failure


Hot In Run Or Start
Power Distribution Cell 10
SIR Fuse 16 15 A
IP Fuse Block
J3
Body Controller (TBC)
A12
J2
Hot With Park Lamps On
Power Distribution Cell 10
ILLUM Fuse 5 10 A
N5
IP Fuse Block
0.8 YEL 1139
0.35 PPL/WHT 1382
0.35 GRY 1220
B
C
D
Inflatable Restraint IP Module Switch
Illumination Lamp
Power On
PSIR Off
Indicator Lamp
Indicator Lamp
0.8 YEL 1139
A
E
F
0.8 TAN/BLK 371
0.8 PNK 353
0.8 BLK 1050
2 BLK 1050 (w/C68)
J3
K13
K12
C203
H
J
SP203
0.8 YEL 1139
0.8 TAN/BLK 371
0.8 PNK 353
10
11
12
F12
C203
2 BLK 1050
G203
Case Ground
Ignition 1
PSIR Enable
PSIR Disable
Inflatable Restraint Sensing And Diagnostic Module
LOC
MAIN

208124

Circuit Description

In the ON position, the ignition switch applies battery voltage to the AIR BAG warning lamp and to the IGNITION 1 input terminal 10. The inflatable restraint sensing and diagnostic module responds by flashing the AIR BAG warning lamp seven times. The inflatable restraint sensing and diagnostic module monitors the voltage levels at the PASSENGER AIR BAG Enable terminal 11 and PASSENGER AIR BAG DISABLE terminal 12 of the inflatable restraint sensing and diagnostic module to determine the position of the inflatable restraint IP module switch.

Conditions for Setting the DTC

- The voltage detected at PASSENGER AIR BAG ENABLE terminal 11 and PASSENGER AIR BAG DISABLE terminal 12 are less than 1.0 volt when the AIR BAG ON lamp is commanded on.
- The voltage detected at PASSENGER AIR BAG ENABLE terminal 11 and PASSENGER AIR BAG DISABLE terminal 12 are greater than 4.0 volts when the AIR BAG ON lamp is commanded OFF.
- The voltage detected at PASSENGER AIR BAG ENABLE terminal 11 and PASSENGER AIR BAG DISABLE terminal 12 are greater than 1.0 volt when the AIR BAG OFF lamp is commanded ON.

Action Taken When the DTC Sets

- The inflatable restraint Sensing and Diagnostic Module (SDM) attempts to illuminate the AIR BAG OFF lamp.
- The inflatable restraint IP module switch is defaulted to the disabled state.
- The SDM sets a diagnostic trouble code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC: The voltage at PASSENGER AIR BAG ENABLE terminal 11 is greater than 4.0 volts for 500 milliseconds and the voltage at PASSENGER AIR BAG DISABLE terminal 12 is less than 1.0 volts for 500 milliseconds when the AIR BAG ON lamp is commanded ON.
- History DTC:
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred

Diagnostic Aids

Refer to *AIR BAG Warning Lamp Comes On Steady* and *AIR BAG Warning Lamp Does Not Come On* to diagnose warning lamp circuit malfunctions.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections*. When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The numbers below refer to the step numbers on the diagnostic table:

2. This test determines if the AIR BAG ON lamp illuminates when the IP module switch is in the ON position.
3. This test checks for a poor connection at the yellow 6-way IP module switch harness connector.
8. This test determines whether the malfunction is in CKT 1050.
10. This test determines whether the malfunction is in CKT 1139 between the fuse block and the IP module switch.
13. This test determines if the state of terminal 11 of the SDM (Pass Air Bag Enable) is correct when the IP module switch is in the ON position.
14. This test checks for proper contact or corrosion of the SDM harness connector.
16. This test checks for an open circuit in CKT 371.
18. This test checks for a short to ground in CKT 371.
21. This test determines if the state of terminal 12 of the SDM (Pass Air Bag Disable) is correct when the IP module switch is in the ON position.
24. This test checks for a short to voltage in CKT 353.
26. This test checks for a short circuit between CKT 353 and 371.
28. This test determines if the AIR BAG OFF lamp illuminates when the IP module switch is in the OFF position.
39. This test checks for a short to voltage in CKT 353.
41. This test checks for a short to voltage in CKT 371.
43. This test checks for an open circuit in CKT 353.
46. This test determines if the state of terminal 11 of the SDM (Pass Air Bag Enable) is correct when the IP module switch is in the OFF position.
47. This test determines if the state of terminal 12 of the SDM (Pass Air Bag Disable) is correct when the IP module switch is in the OFF position.
48. This test determines if the state of the internal SDM suppression lamp driver is correct when the IP module switch is in the OFF position.
49. This test checks for a short to ground in CKT 353.

DTC B1054 Infl Rst IP Module Switch CKT Failure

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	1. Turn the ignition switch to the ON position. 2. Turn the inflatable restraint IP module switch to the OFF position and than back to the ON position. Does the AIR BAG ON lamp illuminate in the IP module switch?	—	*Go to Step 13*	*Go to Step 3*
3	1. Turn the ignition switch to the OFF position. 2. Remove the IP module switch from the instrument panel. Refer to *Infl Rst IP Module Switch Replacement* 3. Inspect the connection of the yellow 6-way IP module switch harness connector to the IP module switch. Is the yellow 6-way IP module switch harness connector properly connected to the IP module switch?	—	*Go to Step 5*	*Go to Step 4*
4	Connect the yellow 6-way IP module switch harness connector securely to the IP module switch. Is the yellow 6-way IP module switch harness connector securely connected to the IP module switch?	—	Go to *SIR Diagnostic System Check*	—

DTC B1054 Infl Rst IP Module Switch CKT Failure (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Disconnect the yellow 6-way IP module switch harness connector from the IP module switch. 2. Inspect the terminals of the yellow 6-way IP module switch harness connector. Are the terminals damaged or corroded?	—	*Go to Step 6*	*Go to Step 7*
6	Repair the yellow 6-way IP module switch harness connector. Refer to *Wiring Repair.* Is the repair complete?	—	*Go to Step 52*	—
7	Carefully inspect the IP module switch terminals for damage or corrosion. Are the terminals damaged or corroded?	—	*Go to Step 51*	*Go to Step 8*
8	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 2. Zero the *J 39200* Digital Multimeter. 3. Measure the resistance from the yellow 6-way IP module switch harness connector terminal F to ground (G203) or known good ground. Is the resistance reading greater than the specified values?	5 Ω	*Go to Step 9*	*Go to Step 10*
9	Repair a high resistance or open circuit in CKT 1050 between the yellow 6-way IP module switch harness connector terminal F and ground (G203). Is the repair complete?	—	*Go to Step 52*	—
10	1. Turn the ignition switch to the ON position. 2. Measure the voltage from the yellow 6-way IP module switch harness connector terminal B to terminal F (ground). Is the voltage reading greater than the specified values?	1 V	*Go to Step 12*	*Go to Step 11*
11	1. Turn the ignition switch to the OFF position. 2. Repair a high resistance or open circuit condition in CKT 1139 between the yellow 6-way IP module switch harness connector terminal B and the IP Fuse Block. Is the repair complete?	—	*Go to Step 52*	—
12	1. Turn the ignition switch to the OFF position. 2. Reconnect the IP module switch to the yellow 6-way IP module switch harness connector. Has the IP module switch been reconnected?	—	*Go to Step 13*	—
13	1. Connect a scan tool to the data link connector. 2. Turn the ignition switch to the ON position. 3. Request the SIR data list display. Does Pass Air Bag IP module show the specified level?	High	*Go to Step 21*	*Go to Step 14*

DTC B1054 Infl Rst IP Module Switch CKT Failure (cont'd)

Step	Action	Value(s)	Yes	No
14	1. Turn the ignition switch to the OFF position. 2. Disconnect the yellow 6-way IP module switch harness connector from the IP module switch. 3. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 4. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 5. Check for proper connection at terminals 11 and 12 on the harness side of the SDM harness connector. Is the SDM harness connector damaged or corroded?	—	*Go to Step 35*	*Go to Step 15*
15	Check for proper connection at terminals 11 and 12 on the SDM. Are the SDM terminals damaged or corroded?	—	*Go to Step 38*	*Go to Step 16*
16	1. Zero the *J 39200* Digital Multimeter. 2. Measure the resistance from the yellow 6-way IP module switch harness connector terminal A to terminal 11 on the SDM harness connector. Is the resistance reading greater than the specified values?	5 Ω	*Go to Step 17*	*Go to Step 18*
17	Repair a high resistance or open circuit condition in CKT 371. Is the repair complete?	—	*Go to Step 52*	—
18	Measure the resistance from the yellow 6-way IP module switch harness connector terminal A to terminal F (ground). Is the resistance reading less than the specified values?	OL	*Go to Step 19*	*Go to Step 20*
19	Repair a short to ground condition in CKT 371. Is the repair complete?	—	*Go to Step 52*	—
20	1. Turn the ignition switch to the OFF position. 2. Reconnect the SIR components. Have the SIR components been reconnected?	—	*Go to Step 21*	—
21	1. Connect a scan tool to the DLC. 2. Turn the ignition switch to the ON position. 3. Request the SIR data list display. Does Pass Air Bag Disable show the specified level?	Low	*Go to Step 28*	*Go to Step 22*
22	1. Turn the ignition switch to the OFF position. 2. Disconnect the yellow 6-way IP module switch harness connector from the IP module switch. 3. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 4. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 5. Check for proper connection at terminals 11 and 12 on the harness side of the SDM harness connector. Is the SDM harness connector damaged or corroded?	—	*Go to Step 35*	*Go to Step 23*
23	Check for proper connection at terminals 11 and 12 on the SDM. Are the SDM terminals damaged or corroded?	—	*Go to Step 38*	*Go to Step 24*

DTC B1054 Infl Rst IP Module Switch CKT Failure (cont'd)

Step	Action	Value(s)	Yes	No
24	1. Turn the ignition switch to the ON position. 2. Measure the voltage from the yellow 6-way IP module switch harness connector terminal E to terminal F (ground). Is the voltage reading greater than the specified values?	1 V	*Go to Step 25*	*Go to Step 26*
25	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 353. Is the repair complete?	—	*Go to Step 52*	—
26	1. Turn the ignition switch to the OFF position. 2. Measure the resistance from the yellow 6-way IP module switch harness connector terminal A to terminal E. Is the resistance reading less than the specified values?	OL	*Go to Step 27*	*Go to Step 51*
27	Repair a short circuit between CKT 353 and CKT 371. Is the repair complete?	—	*Go to Step 52*	—
28	1. Turn the ignition switch to the OFF position. 2. Turn the inflatable restraint IP module switch to the OFF position. 3. Turn the ignition switch to the ON position. Does the AIR BAG OFF lamp illuminate in the IP module switch?	—	*Go to Step 46*	*Go to Step 29*
29	1. Turn the ignition switch to the OFF position. 2. Remove the IP module switch from the instrument panel. 3. Inspect the connection of the yellow 6-way IP module switch harness connector to the IP module switch. Is the yellow 6-way IP module switch harness connector properly connected to the IP module switch?	—	*Go to Step 31*	*Go to Step 30*
30	Connect the yellow 6-way IP module switch harness connector securely to the IP module switch. Is the yellow 6-way IP module switch harness connector securely connected to the IP module switch?	—	Go to *SIR Diagnostic System Check*	—
31	1. Disconnect the yellow 6-way IP module switch harness connector from the IP module switch. 2. Inspect the terminals of the yellow 6-way IP module switch harness connector. Are the terminals damaged or corroded?	—	*Go to Step 32*	*Go to Step 33*
32	Repair the yellow 6-way IP module switch harness connector. Refer to *Wiring Repair.* Is the repair complete?	—	*Go to Step 52*	—
33	Carefully inspect the IP module switch terminals for damage or corrosion. Are the terminals damaged or corroded?	—	*Go to Step 51*	*Go to Step 34*
34	1. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 2. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 3. Check for proper connection at terminals 11 and 12 on the SDM harness connector. Is the SDM harness connector damaged or corroded?	—	*Go to Step 35*	*Go to Step 37*

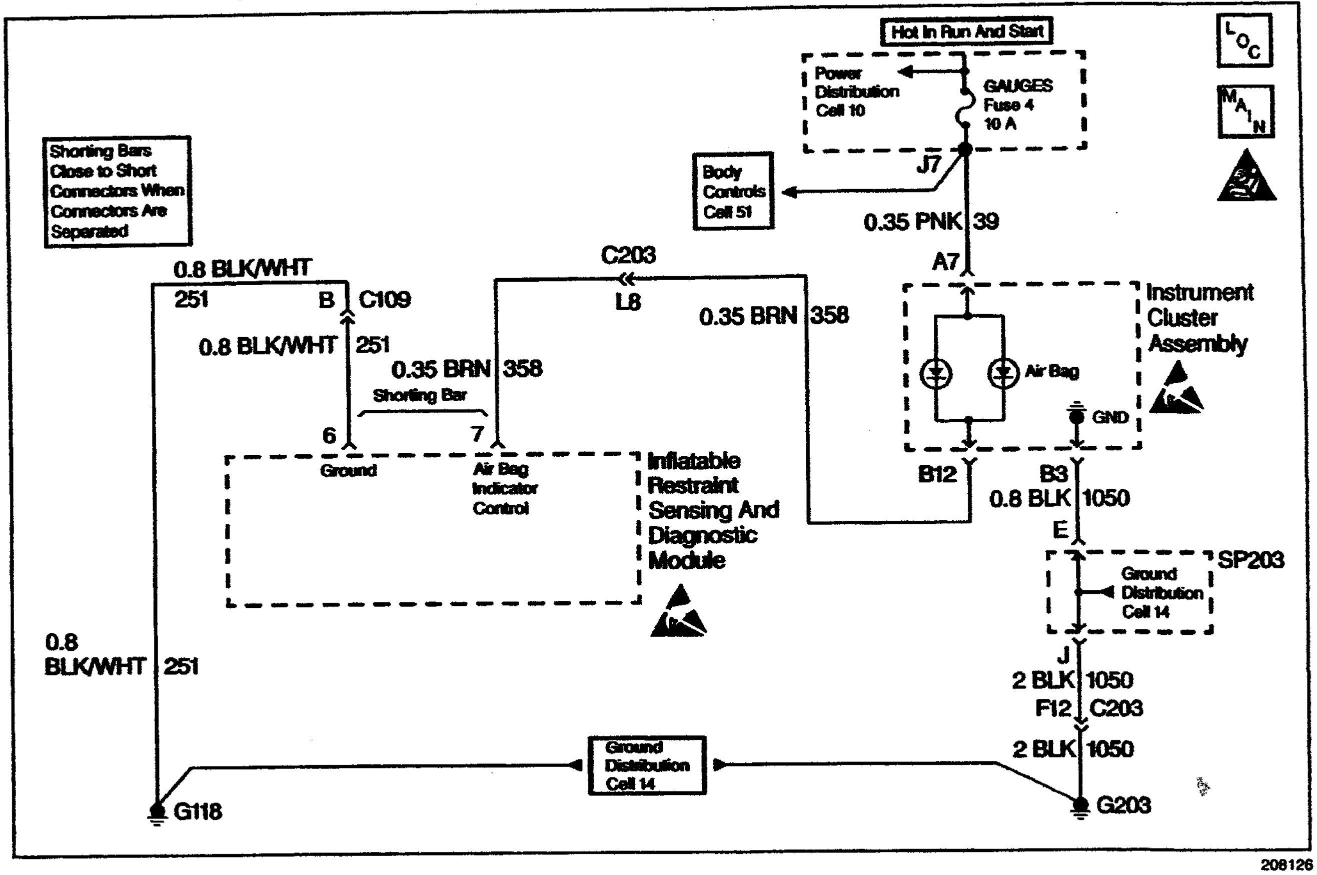
DTC B1054 Infl Rst IP Module Switch CKT Failure (cont'd)

Step	Action	Value(s)	Yes	No
35	Replace the SDM harness connector. Refer to *Wiring Repair.* Has the SDM harness connector been replaced?	—	*Go to Step 36*	—
36	Check for proper connection at terminals 11 and 12 on the SDM. Are the SDM terminals damaged or corroded?	—	*Go to Step 38*	*Go to Step 52*
37	Check for proper connection at terminals 11 and 12 on the SDM. Are the SDM terminals damaged or corroded?	—	*Go to Step 38*	*Go to Step 39*
38	Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Has the SDM been replaced?	—	*Go to Step 52*	—
39	1. Turn the ignition switch to the ON position. 2. Measure the voltage from the yellow 6-way IP module switch harness connector terminal E to terminal F (ground). Is the voltage reading greater than the specified values?	1 V	*Go to Step 40*	*Go to Step 41*
40	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 353. Is the repair complete?	—	*Go to Step 52*	—
41	Measure the voltage from the yellow 6-way IP module switch harness connector terminal A to terminal F (ground). Is the voltage reading greater than the specified values?	1 V	*Go to Step 42*	*Go to Step 43*
42	1. Turn the ignition switch to the OFF position. 2. Repair a short to B+ condition in CKT 371. Is the repair complete?	—	*Go to Step 52*	—
43	1. Turn the ignition switch to the OFF position. 2. Measure the resistance from the yellow 6-way IP module switch harness connector terminal E to terminal 12 on the SDM harness connector. Is the resistance reading greater than the specified values?	5 Ω	*Go to Step 44*	*Go to Step 45*
44	Repair a high resistance or open circuit condition in CKT 353 Is the repair complete?	—	*Go to Step 52*	—
45	1. Turn the ignition switch to the OFF position. 2. Reconnect the SIR system components. Have the SIR system components been reconnected?	—	*Go to Step 46*	—
46	1. Connect a scan tool to the data link connector. 2. Turn the ignition switch to the ON position. 3. Request the SIR data list display. Does Pass Air Bag IP module show the specified level?	Low	*Go to Step 47*	Go to *SDM Integrity Check*
47	Does Pass Air Bag Disable show the specified level?	Low	*Go to Step 48*	Go to *SDM Integrity Check*
48	Does Suppression Lamp Driver show the specified level?	On	*Go to Step 49*	Go to *SDM Integrity Check*

DTC B1054 Infl Rst IP Module Switch CKT Failure (cont'd)

Step	Action	Value(s)	Yes	No
49	1. Turn the ignition switch to the OFF position. 2. Disconnect the inflatable restraint steering wheel yellow 2-way connector at the base of the steering column and IP module yellow 2-way connector located behind the glove box. 3. Disconnect the SDM harness connector. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* 4. Measure the resistance from the yellow 6-way IP module switch harness connector terminal E to terminal F (ground). Is the resistance reading less then the specified values?	OL	*Go to Step 50*	*Go to Step 51*
50	Repair a short to ground condition in CKT 353. Is the repair complete?	—	*Go to Step 52*	—
51	Replace the inflatable restraint IP module switch. Refer to *Infl Rst IP Module Switch Replacement.* Is the repair complete?	—	*Go to Step 52*	—
52	Reconnect all the SIR system components. Make sure all the SIR system components are properly mounted. Have all the SIR components been reconnected and properly mounted?	—	*Go to Step 53*	—
53	Clear the SIR diagnostic trouble codes. Have all the SIR diagnostic trouble codes been cleared?	—	Go to *SIR Diagnostic System Check*	—

DTC B1061 Lamp Circuit Failure


Hot In Run And Start
Power Distribution Cell 10
GAUGES Fuse 4 10 A
J7
Body Controls Cell 51
0.35 PNK 39
A7
Instrument Cluster Assembly
Air Bag
GND
B12
B3
0.8 BLK 1050
E
SP203
Ground Distribution Cell 14
J
2 BLK 1050
F12 C203
2 BLK 1050
G203
Ground Distribution Cell 14
G118
0.8 BLK/WHT 251
Shorting Bars Close to Short Connectors When Connectors Are Separated
0.8 BLK/WHT
251
B C109
0.8 BLK/WHT 251
0.35 BRN 358
Shorting Bar
6
7
Ground
Air Bag Indicator Control
Inflatable Restraint Sensing And Diagnostic Module
C203
L8
0.35 BRN 358

208126

Circuit Description

In the ON position, the ignition switch applies battery voltage to the AIR BAG warning lamp and to the IGNITION 1 input terminal 10. The inflatable restraint Sensing and Diagnostic Module (SDM) responds by flashing the AIR BAG warning lamp seven times. The SDM monitors the lamp driver output by comparing the output state at the INFLATABLE RESTRAINT INDICATOR terminal 7 to the microprocessor commanded state.

Conditions for Setting the DTC

The output state at the INFLATABLE RESTRAINT INDICATOR terminal 7 does not match the commanded state of the lamp driver for 400 milliseconds.

The CONTINUOUS MONITORING test checks for this DTC. This test occurs when IGNITION 1 is within the normal operating voltage range.

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM attempts to turn ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC—The output state at the INFLATABLE RESTRAINT INDICATOR terminal 7 matches the commanded state of the lamp driver for 400 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

Refer to *AIR BAG Warning Lamp Comes On Steady* and *AIR BAG Warning Lamp Does Not Come On* to diagnose warning lamp circuit malfunctions.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Test Description

The number below refers to the step number on the diagnostic table:

2. When the inflatable restraint Sensing and Diagnostic Module (SDM) is configured for a serial data controlled warning indicator (smart cluster), DTC B1061 will set.

DTC B1061 Lamp Circuit Failure

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	Go to *Step 2*	Go to *SIR Diagnostic System Check*
2	1. Malfunctions within the AIR BAG warning lamp circuitry can set this DTC. These malfunctions are addressed via the SIR Diagnostic System Check. Failure to properly perform the SIR Diagnostic System Check may result in misdiagnosis. • When AIR BAG warning lamp comes ON steady, refer to *AIR BAG Warning Lamp Comes On Steady.* • When AIR BAG warning lamp comes does not come ON, refer to *AIR BAG Warning Lamp Does Not Come On.* 2. Turn the ignition switch to the ON position. 3. Clear the SIR DTC codes. 4. Request the SIR DTC display. Is DTC B1061 set?	—	Go to *SDM Integrity Check*	Go to *SIR Diagnostic System Check*

DTC B1071 Internal SDM Failure

Circuit Description

DTC B1071 is an indication of a potential internal inflatable restraint Sensing and Diagnostic Module (SDM) malfunction. DTC B1071 will set upon detection of any condition in the table below.

Conditions for Setting the DTC

Malfunction	Detection Test
23 VLR voltage out of normal operating range.	Power-On, Continuous monitoring
Crash data recording reserve voltage discharge time failure for three consecutive ignition cycles.	Power-On
The calculated checksum for internal memory does not match the stored value.	Power-On
The driver or passenger deployment loop is shorted to ground.	Continuous monitoring
The Accelerometer is malfunctioning.	Power-On, Continuous monitoring
The driver or passenger current source is malfunctioning.	Resistance measurement
The temporary memory storage area is malfunctioning.	Power-On
The Inflatable Restraint Sensing and Diagnostic Module (SDM) is unable to read from or write to EEPROM.	Power-On
The arming sensor inside the Inflatable Restraint Sensing and Diagnostic Module (SDM) is not closed during a deployment event.	Asynchronously
The voltage measured at DRIVER SIDE LOW and PASSENGER SIDE LOW is too low.	Power-On, Continuous monitoring
The device inside the Inflatable Restraint Sensing and Diagnostic Module that arms the system for deployment is malfunctioning.	Power-On, Continuous monitoring
The permanent memory storage area is malfunctioning.	Power-On

Action Taken When the DTC Sets

- The SDM sets a Diagnostic Trouble Code.
- The SDM turns ON the AIR BAG warning lamp.

Conditions for Clearing the DTC

- Current DTC— The malfunction has not been detected for 500 milliseconds.
- History DTC
  - You issue a scan tool CLEAR CODES command.
  - Once 250 malfunction free ignition cycles have occurred.

Diagnostic Aids

When you issue a scan tool CLEAR CODES command, some of the indicated malfunctions will only allow the AIR BAG warning lamp to go out briefly then come back ON.

When measurements are requested in this table, use *J 39200* Digital Multimeter with the correct terminal adapter from *J 35616-A* Connector Test Adapter Kit. When a check for proper connection is requested, refer to *Intermittents and Poor Connections.* When a wire, connector or terminal repair is requested, use *J 38125-A* Terminal Repair Kit and refer to *Wiring Repair.*

Notice: When DTC B1018 or B1024 has been set it is necessary to replace the inflatable restraint Sensing and Diagnostic Module (SDM). Setting DTC B1018 or B1024 will also cause DTC B1071 to set. When a scan tool clear codes command is issued and the malfunction is no longer present, DTC B1018 or B1024 and DTC B1071 will remain current. Make sure that the short to ground condition is repaired prior to installing a replacement SDM to avoid damaging the SDM.

DTC B1071 Internal SDM Failure

Step	Action	Value(s)	Yes	No
1	Was the SIR Diagnostic System Check performed?	—	*Go to Step 2*	Go to *SIR Diagnostic System Check*
2	Is DTC B1018 set?	—	Go to *DTC B1018 Passenger Deployment Loop Short to GND*	*Go to Step 3*
3	Is DTC B1024 set?	—	Go to *DTC B1024 Driver Deployment Loop Short to Ground*	*Go to Step 4*
4	1. Turn the ignition switch to the OFF position. 2. Replace the SDM. Refer to *Infl Rst Sensing and Diagnostic Module Replacement.* Are the repairs complete?	—	Go to *SIR Diagnostic System Check*	—

Repair Instructions

SIR Service Precautions

Caution: When you are performing service on or near the SIR components or the SIR wiring, you must disable the SIR system. Use the following procedure to temporarily disable the SIR system. Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

The inflatable restraint Sensing and Diagnostic Module (SDM) maintains a reserve energy supply. Ignition voltage can provide deployment energy if the 23 Volt Loop Reserve malfunction. Deployment power is available for as much as 10 minutes after disconnecting the vehicle power by any of the following methods:

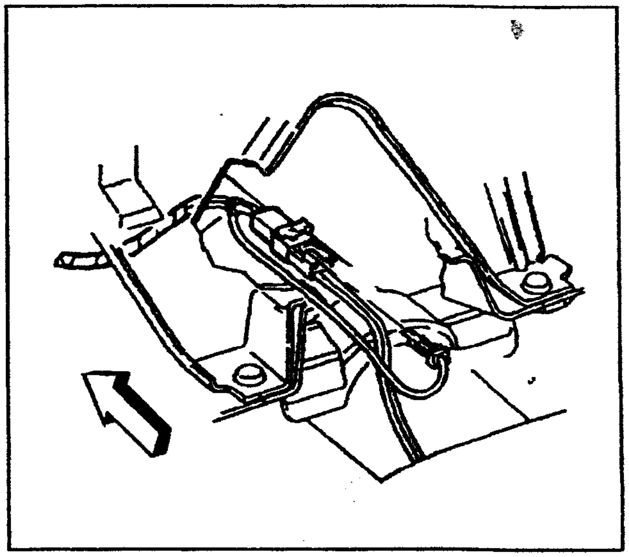
- You turn the ignition switch to the OFF position.
- You remove the fuse that provides power to the SDM.
- You disconnect the vehicle battery from the vehicle electrical system.

Performing the following procedure prevents deploying of the air bags from the reserve energy supply power.

Disabling the SIR System

1. Turn the steering wheel so that the vehicle's wheels are pointing straight ahead.
2. Turn the ignition switch to the LOCK position.
3. Remove the key from the ignition switch.

   Important: With the SIR Fuse removed and the ignition switch in the ON position, The AIR BAG warning lamp illuminates. This is normal operation, and does not indicate an SIR system malfunction.
4. Remove the SIR Fuse from the IP fuse block.
5. Remove the sound insulator-LH. Refer to Instrument Panel Sound Insulator Replacement in Interior Trim.
6. Remove the knee bolster (if equipped). Refer to Knee Bolster Replacement in Interior Trim.
7. Remove the Connector Position Assurance (CPA) from the driver yellow 2-way connector located at the base of the steering column.



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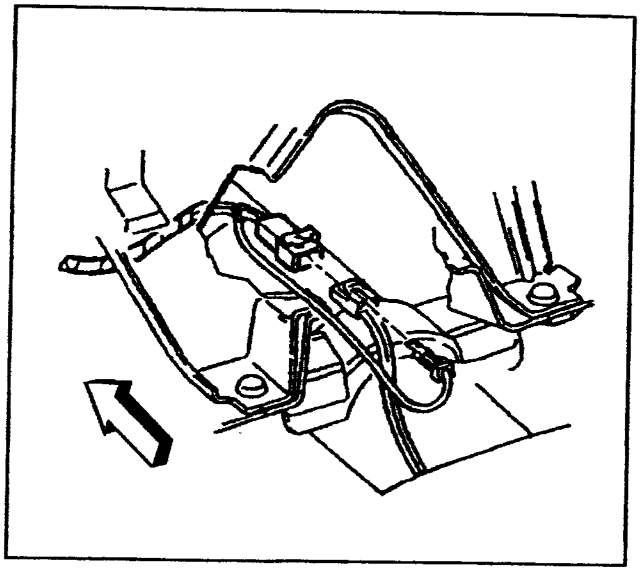
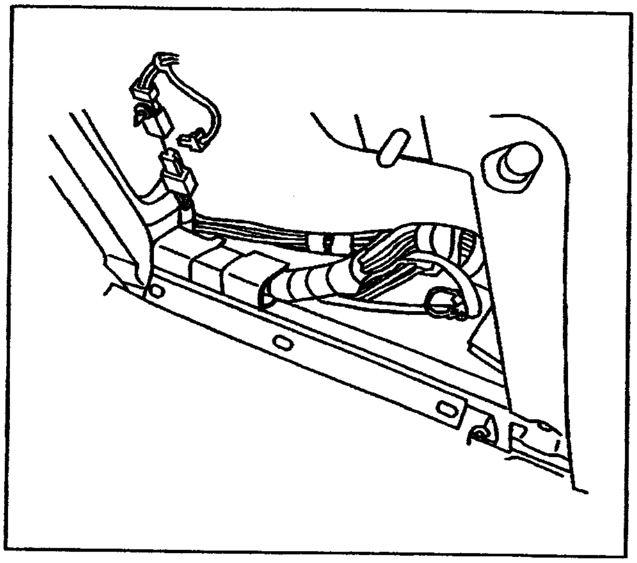
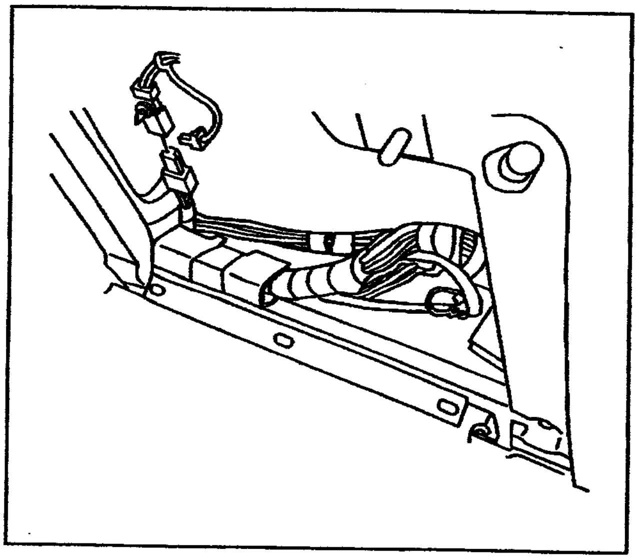


8. Disconnect the driver yellow 2-way connector located at the base of the steering column.



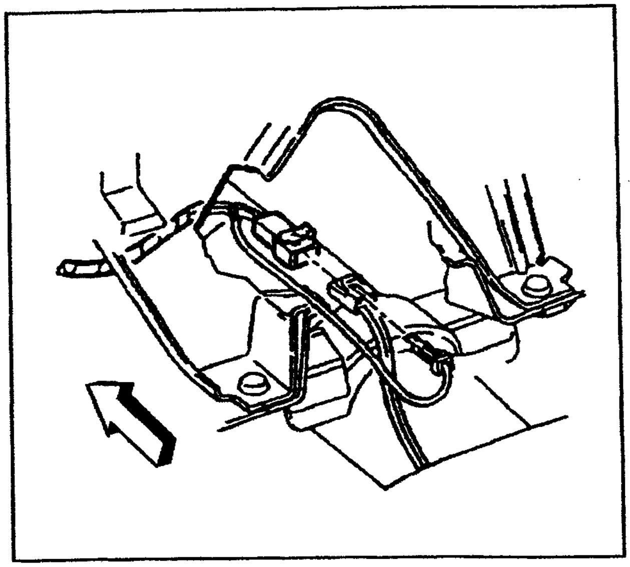
9. Remove the Connector Position Assurance (CPA) from the passenger yellow 2-way connector located behind the glove box.
10. Disconnect the passenger yellow 2-way connector located behind the glove box.



Enabling the SIR System

1. Remove the key from the ignition switch.
2. Connect the passenger yellow 2-way connector located behind the glove box.
3. Install the Connector Position Assurance (CPA) to the passenger yellow 2-way connector located behind the glove box.

4. Connect the driver yellow 2-way connector located at the base of the steering column.



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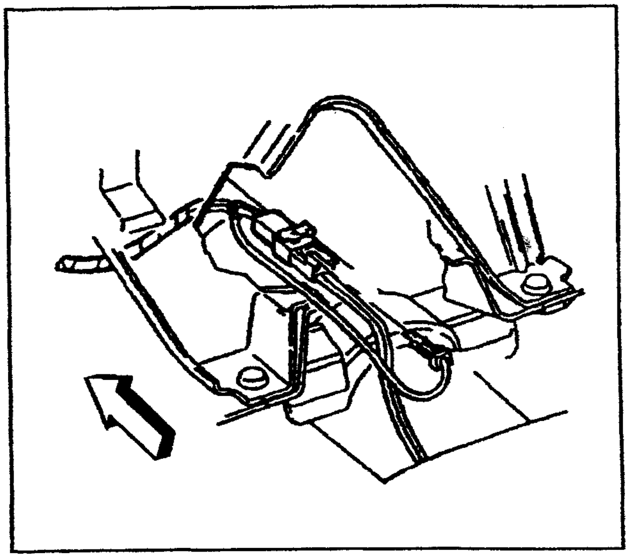
5. Install the Connector Position Assurance (CPA) to the driver yellow 2-way connector located at the base of the steering column.
6. Install the knee bolster (if equipped). Refer to Knee Bolster Replacement in Interior Trim.
7. Install the sound insulator-LH. Refer to Instrument Panel Sound Insulation Replacement in Interior Trim.
8. Install the SIR Fuse to the IP fuse block.
9. Staying well away from both air bags, turn the ignition switch to the ON position.
    - 9.1. The AIR BAG warning lamp will flash seven times.
    - 9.2. The AIR BAG warning lamp will then turn OFF.
10. Perform the SIR Diagnostic System Check if the AIR BAG warning lamp does not operate as described.



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General Service Instructions

- Do not expose the inflator modules to temperatures above 65°C (150°F).
- Verify the correct replacement part number. Do not substitute a component from a different vehicle.
- Service these components by replacement only.
- Do not repair any of the following components:
  - The inflatable restraint Sensing and Diagnostic Module (SDM).
  - The inflatable restraint IP (inflator) module.
  - The inflatable restraint IP module switch.
  - The inflatable restraint steering wheel (inflator) module.
  - The inflatable restraint steering wheel module coil.
  - The inflatable restraint front end discriminating sensor.
- Use only new or remanufactured parts from an authorized original equipment manufacturer dealer. Do not use salvaged parts for repairs to the SIR system.
- Do not install the component in a vehicle.
- Discard any of the following components if it has been dropped from a height of 91 centimeters (3 feet) or greater.
  - The inflatable restraint Sensing and Diagnostic Module (SDM).
  - The inflatable restraint IP (inflator) module.
  - The inflatable restraint IP module switch.
  - The inflatable restraint steering wheel (inflator) module.
  - The inflatable restraint steering wheel module coil.
  - The inflatable restraint front end discriminating sensor.
- When you replace the SDM, verify that the following conditions are met:
  - The mounting surface is clean.
  - The arrow on the module points toward the front of the vehicle.
  - The module is flat on the mounting surface, parallel to the vehicle datum line.
  - The module fasteners are installed and tightened as specified.
- In order to avoid setting false diagnostic trouble codes, only apply power to the SIR system when one of the following two conditions is met:
  - All SIR system components are properly mounted and electrically connected.
  - A diagnostic procedure directs you to apply power.
- Begin diagnosis of malfunctions with the SIR Diagnostic System Check. Perform the SIR Diagnostic System Check in order to verify the following:
  - The proper operation of the AIR BAG warning lamp.
  - Communication with the SDM through the serial data line.
  - The presence or absence of diagnostic trouble codes.
  - Whether additional diagnosis is required and where the information resides.

Not beginning with the SIR Diagnostic System Check could cause extended diagnostic time, incorrect diagnosis, and unneeded parts replacement.

Infl Rst Sensing and Diagnostic Module Replacement

Caution: Be careful when you handle a Sensing and Diagnostic Module (SDM). Do not strike or jolt the SDM. Before applying power to the SDM:

- ***Remove any dirt, grease, etc. from the mounting surface***
- ***Position the SDM horizontally on the mounting surface***
- ***Point the arrow on the SDM toward the front of the vehicle***
- ***Tighten all of the SDM fasteners and SDM bracket fasteners to the specified torque value***

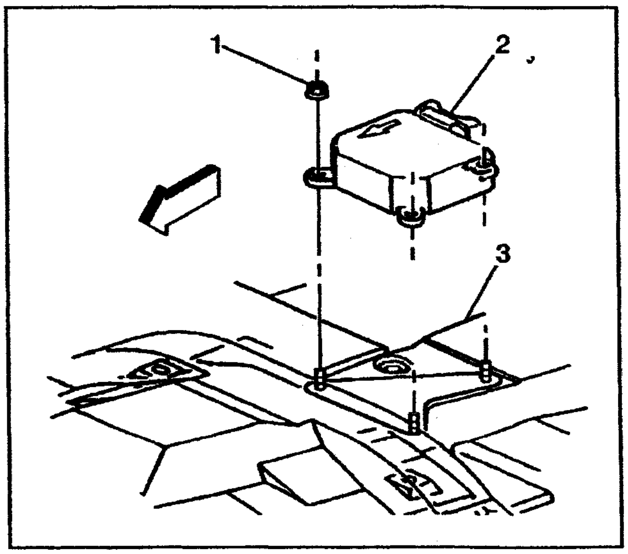
Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

Caution: If any water enters the vehicle's interior up to the level of the carpet or higher and soaks the carpet, the Sensing and Diagnostic Module (SDM) and the SDM harness connector may need to be replaced. The SDM could be activated when powered, which could cause deployment of the air bag(s) and result in personal injury. Before attempting these procedures, the SIR system must be disabled. Refer to Disabling SIR System in this section. With the ignition OFF, inspect the SDM mounting area, including the carpet. If any significant soaking or evidence of significant soaking is detected, you MUST:

- ***Remove all water***
- ***Repair the water damage***
- ***Replace the SDM harness connector***
- ***Replace the SDM***

Failure to follow these procedures could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

Removal Procedure



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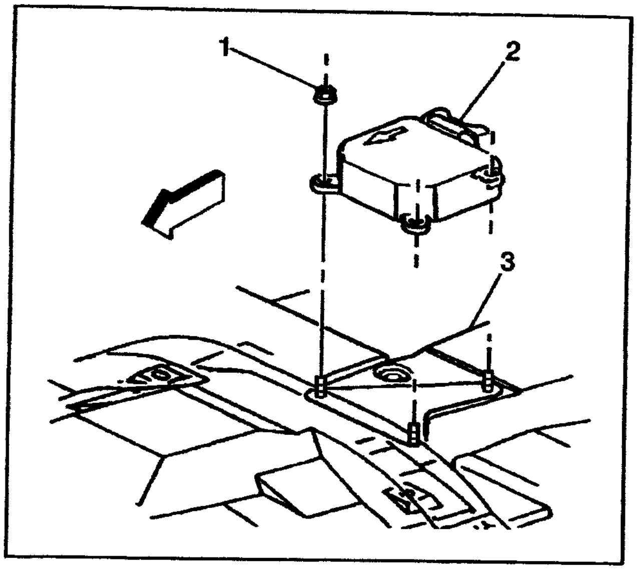
1. Disable the SIR system. Refer to *Disabling the SIR System.*
2. Remove the drivers seat, Refer to Front Seat Replacement in Seats.
3. Remove driver seat belt from floor. Refer to Seat Belt Replacement in Seat Belts.
4. Remove the carpet retaining sill trim molding - LH. Refer to Sill Trim Plate Replacement in Interior Trim.
5. Remove the floor console (if equipped), Refer to Floor Console Replacement in Interior Trim.
6. Fold back the carpet to access the inflatable restraint Sensing and Diagnostic Module (SDM).
7. Remove the Connector Position Assurance (CPA) from the SDM harness connector.
8. Disconnect the SDM harness connector from the SDM.
9. Remove the SDM mounting fasteners (1).
10. Remove the SDM (2) from the vehicle (3).



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Installation Procedure

1. Install the SDM (2) to the vehicle (3).
2. Install the SDM mounting fasteners (1).

   Tighten

   Tighten fasteners to 12 N.m (106 lb in). Refer to *Fastener Notice* in Cautions and Notices.
3. Install the SDM harness connector to the SDM.
4. Install the Connector Position Assurance (CPA) to the SDM harness connector.
5. Position the carpet to cover the inflatable restraint Sensing and Diagnostic Module (SDM).
6. Install the floor console (if equipped), Refer to Floor Console Replacement in Interior Trim.
7. Install the carpet retaining sill trim molding — LH, Refer to Sill Trim Plate Replacement in Interior Trim.
8. Install driver seat belt to floor. Refer to Seat Belt Replacement in Seat Belts.
9. Install the driver seat, Refer to Front Seat Replacement in Seats.
10. Enable the SIR system. Refer to *Enabling the SIR System.*

Infl Rst Instrument Panel Module Replacement

Refer to Inflatable Restraint IP Module Replacement in Interior Trim for replacement of the inflatable restraint IP module.

Infl Rst Front End Discriminating Sensor Replace

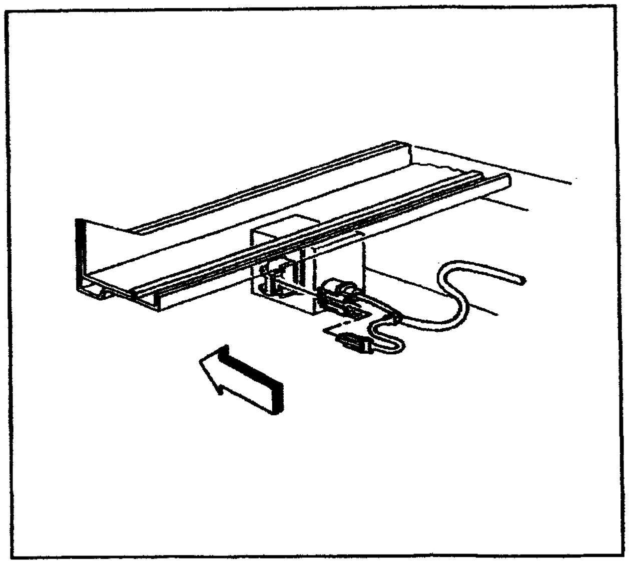
Caution: Be careful when you handle a sensor. Do not strike or jolt a sensor. Before applying power to a sensor:

- ***Remove any dirt, grease, etc. from the mounting surface.***
- ***Position the sensor horizontally on the mounting surface.***
- ***Point the arrow on the sensor toward the front of the vehicle.***
- ***Tighten all of the sensor fasteners and sensor bracket fasteners to the specified torque value.***

Failure to follow the correct procedure could cause air bag deployment, personal injury, or unnecessary SIR system repairs.

Removal Procedure

1. Disable the SIR system. Refer to *Disabling the SIR System*.
2. Remove off road skid plate if equipped.
3. Remove the Connector Position Assurance (CPA) from the inflatable restraint front end discriminating sensor harness connector.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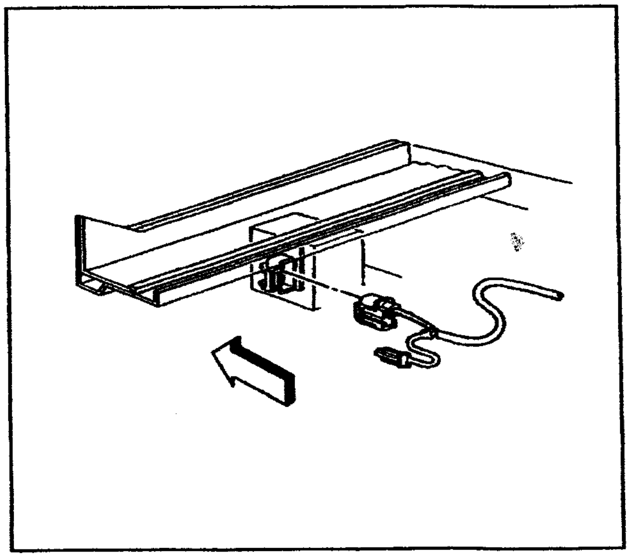
4. Disconnect the inflatable restraint front end discriminating sensor harness connector from the sensor.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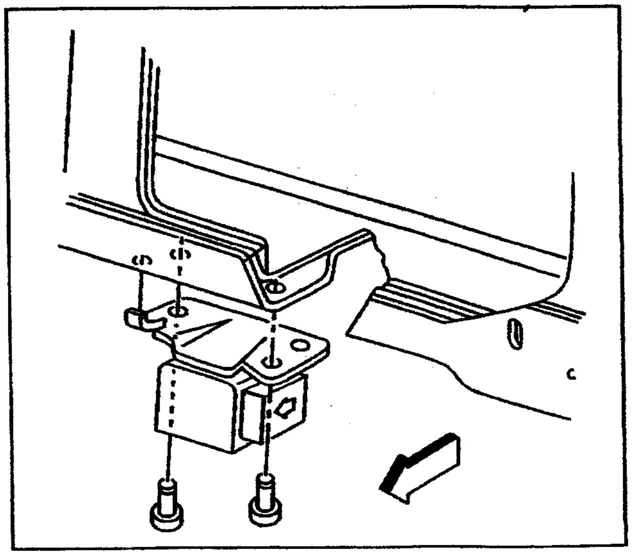
5. Drill out the mounting rivets.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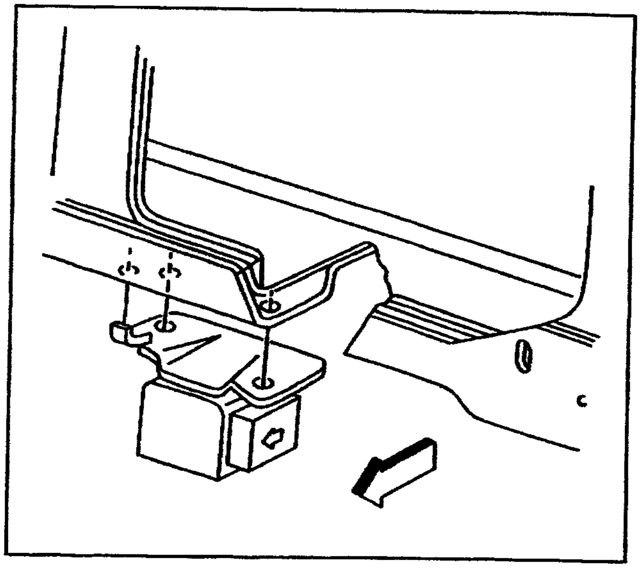


6. Remove the inflatable restraint front end discriminating sensor from the vehicle.

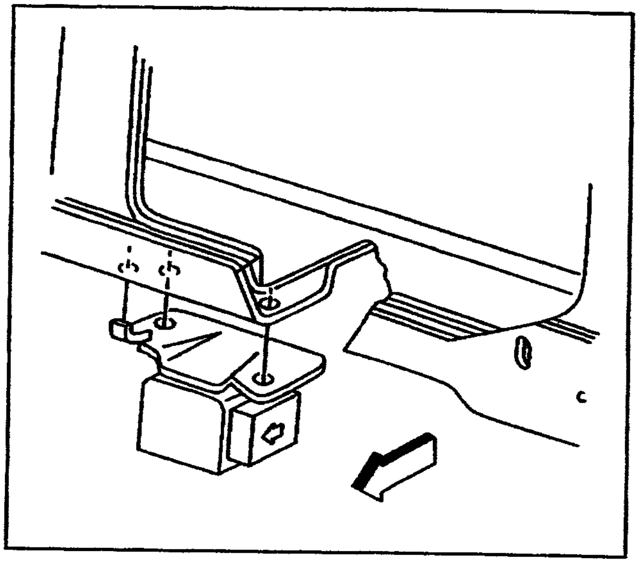
Important: The following procedures should be utilized in the event that sensor mounting holes or fasteners are damaged to the extent that the sensor can no longer be properly mounted.

- First Fastener Repair
    1. Remove and discard the improperly installed rivet.
    2. Reattach sensor with new rivet.
- Second Fastener Repair
    1. Remove the improperly installed rivet.
    2. Enlarge the mounting holes in the lower radiator support to 9.0 mm (0.35 in).
    3. Insert and properly seat rivnut.
    4. Install sensor with screw.

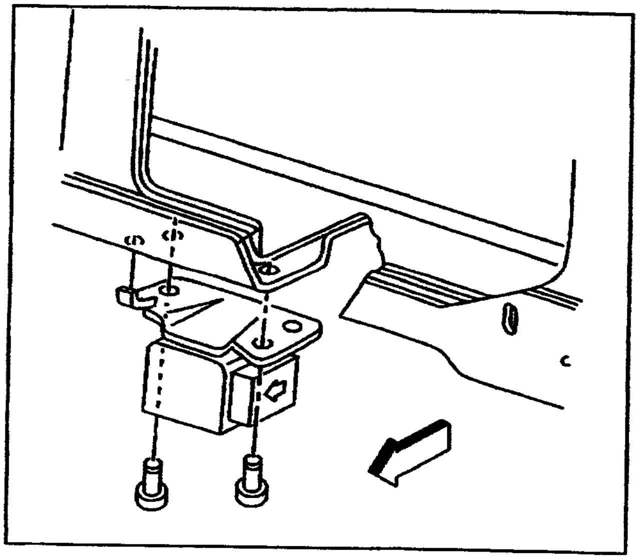
    Tighten

    Tighten fasteners to 8.0 N.m (71 lb in). Refer to *Fastener Notice*

Installation Procedure

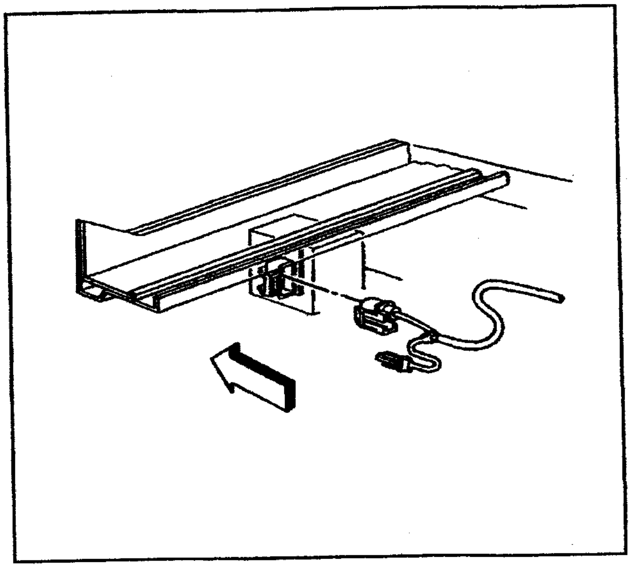


1. Install the inflatable restraint front end discriminating sensor to the lower radiator support surface make sure the arrow is pointing toward the front of the vehicle.



2. Install the inflatable restraint front end discriminating sensor mounting rivets (part # 15715058).

3. Connect the inflatable restraint front end discriminating sensor harness connector to the sensor.



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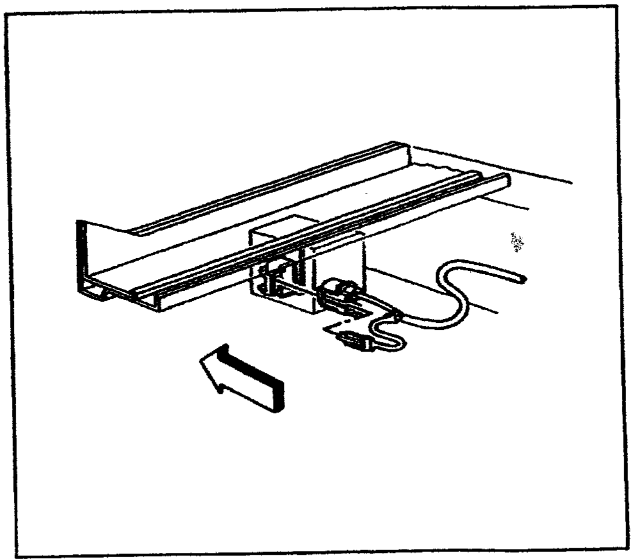
4. Install the Connector Position Assurance (CPA) to the inflatable restraint front end discriminating sensor harness connector.
5. Install the off road skid plate in equipped.
6. Enable the SIR system. Refer to *Enabling the SIR System.*



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Infl Rst IP Module Switch Replacement

Refer to Inflatable Restraint IP Module Switch Replacement in Interior Trim for replacement of the inflatable restraint IP module switch.

Infl Rst Steering Wheel Module Replacement

Refer to Inflatable Restraint Driver Inflator Module Replacement in Steering Wheel and Column for replacement of the inflatable restraint driver inflator module.

Infl Rst Steering Wheel Module Coil Replacement

Refer to Inflatable Restraint Steering Wheel Module Coil Replacement in Inflatable Restraint Steering Column for replacement of the inflatable restraint steering wheel module coil.

AIR BAG Warning Lamp Replacement

The AIR BAG warning lamp is two light Emitting Diodes (LED). The LEDs are not serviceable. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges for replacement of the Instrument Cluster.

Wiring Repair

The Supplemental Inflatable Restraint (SIR) system requires special wiring repair procedures due to the sensitive nature of the circuitry. These specific procedures and instructions must be followed when working with the SIR system wiring, and the wiring components (such as connectors and terminals).

Terminal Repair Kit J 38125-A

Important: Do not use the terminals in the kit to replace damaged SIR system terminals unless specifically indicated by the terminal package.

Essential tool kit *J 38125-A* Terminal Repair Kit contains the following:

- Special sealed splices to repair the SIR system wiring
- Wire stripping tool
- Special crimping tool
- Heat torch
- Instruction manual

The two critical features of the sealed splices are:

- A special heat shrink sleeve environmentally seals the splice. Inside the heat shrink sleeve is a sealing adhesive.
- A cross hatched (knurled) core crimp provides necessary contact integrity for the sensitive, low energy circuits.

The *J 38125-A* Terminal Repair Kit also serves as a generic terminal repair kit. The kit contains the following:

- A large sampling of common GM electrical terminals.
- The correct tools to attach the terminals to wires.
- The correct tools to remove the terminals from connectors.

SIR Connector (Plastic Body and Terminal Metal Pin) Repair

Repair damaged SIR wire harness connectors and terminals (except pigtails) using the connector repair assembly packs. These kits include an instruction sheet and the sealed splices. Use the sealed splices to splice the new wires, connector, and terminals to the harness. The splice crimping tool is color keyed to match the splices from *J 38125-A* Terminal Repair Kit. You must use the splice crimping tool to apply these splices.

The terminals in the SIR system are made of a special metal. This special metal provides the necessary contact integrity for the sensitive, low energy circuits. These terminals are only available in the connector repair assembly packs. Do not substitute any other terminals for those in the assembly packs.

If individual terminals are damaged on the Sensing and Diagnostic Module (SDM) harness connector, you must replace the SDM harness connector using one of the following two components:

- SDM harness connector pigtail assembly.
- SDM harness connector replacement kit.

If individual terminals are damaged on any other SIR connection, the entire connection should be replaced. Use the appropriate connector repair assembly pack. You should replace the entire SIR wiring harness, if necessary to maintain SIR circuit integrity.

SIR Wire Pigtail Repair

Important: Do not make wire, connector, or terminal repairs on components with wire pigtails.

A wire pigtail is a wire or wires attached directly to the device (not by a connector). If a wiring pigtail is damaged, the entire component (with pigtail) must be replaced. The inflatable restraint steering wheel module coil is an example of a pigtail component.

SIR Wire Repair

Tools Required

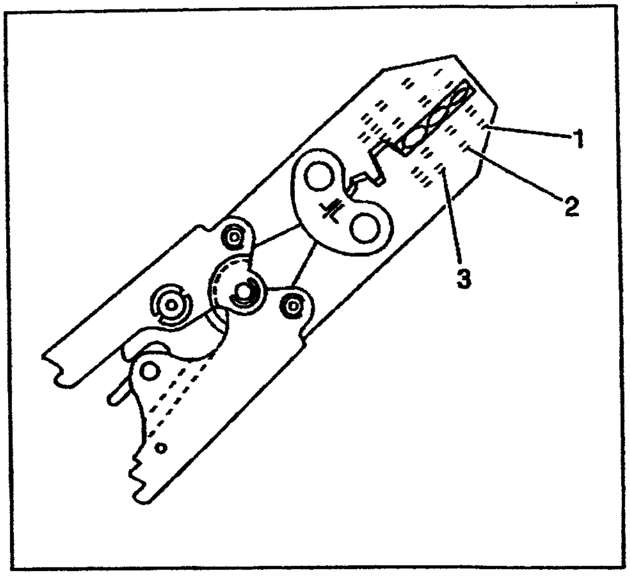
J 38125-A Terminal Repair Kit

Important: Refer to Wiring Repairs in Wiring Systems in order to determine the correct wire size for the circuit you are repairing. You must obtain this information in order to ensure circuit integrity.

If any wire except the pigtail is damaged, repair the wire by splicing in a new section of wire of the same gauge size (0.5 mm, 0.8 mm, 1.0 mm etc.). Use the sealed splices and splice crimping tool from *J 38125-A* Terminal Repair Kit. Use the following wiring repair procedures to ensure the integrity of the sealed splice.

Important: You must perform the following procedures in the listed order. Repeat the procedure if any wire strands are damaged. You must obtain a clean strip with all of the wire strands intact.

1. Open the Harness.
   - Open the harness by removing any tape.
   - To avoid wire insulation damage, use a sewing seam ripper (available from sewing supply stores) to cut open the harness.
   - Use the crimp and sealed splice sleeves on all types of insulation except tefzel and coaxial.
   - Do not use the crimp and sealed splice sleeve to form a splice with more than two wires coming together.
2. Cut the Wire.
   - Cut as little wire off the harness as possible. You may need the extra length of wire to change the location of a splice.
   - Adjust splice locations so that each splice is at least 40 mm (1.5 in) away from the other splices, harness branches, or connectors.
3. Strip the Insulation.
   - When adding a length of wire to the existing harness, be certain to use the same size wire as the original wire.
   - To find the correct wire size do one of the following:
     - Find the wire on the schematic and convert the metric size to the equivalent AWG size.
     - Use an AWG wire gauge.
     - If you are unsure of the wire size, begin with the largest opening in the wire stripper and work down until achieving a clean strip of the insulation.
   - Strip approximately 7.5 mm (0.313 in) of insulation from each wire to be spliced.
   - Be careful to avoid nicking or cutting any of the strands. Check the stripped wire for nicks or cut strands.
   - If the wire is damaged, repeat this procedure after removing the damaged section.
4. Select and Position the Splice Sleeve.
   - Select the proper sealed splice sleeve according to wire size.
   - See the following table for color coding of the splice sleeves, and the crimp tool nests.



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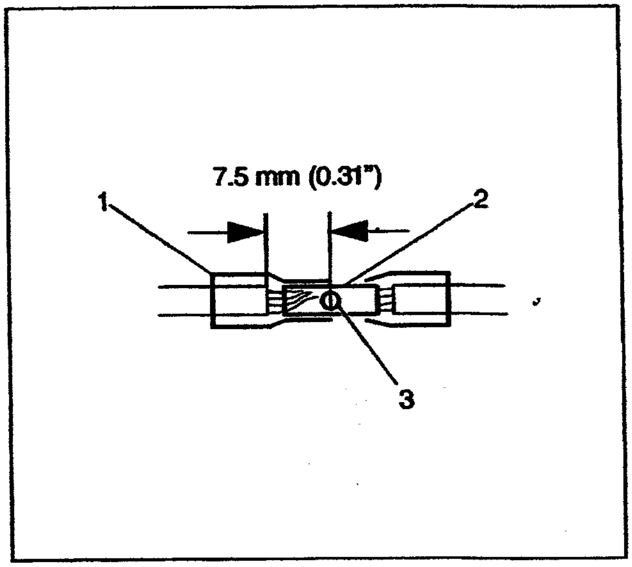
   - Use the Splice Crimp Tool from *J 38125-A* Terminal Repair Kit to position the splice sleeve in the proper color nest of the Splice Crimp Tool.



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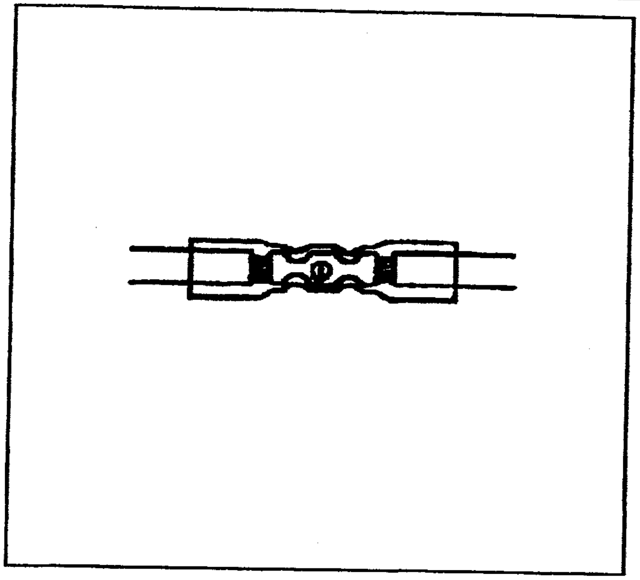
   - Place the splice sleeve in the nest so that the crimp falls midway between the end of the barrel and the stop. The sleeve has a stop (3) in the middle of the barrel (2) to prevent the wire (1) from going further. Close the hand crimper handles slightly to hold the splice sleeve firmly in the proper nest.



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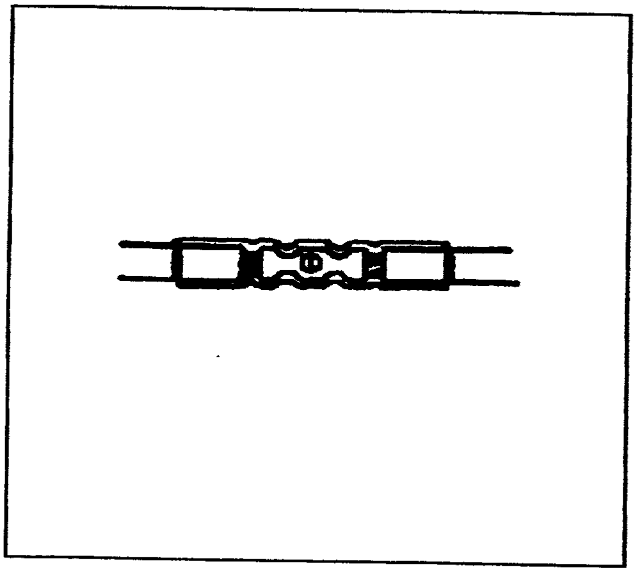
5. Insert Wires Into Splice Sleeve and Crimp.
   - Insert the wire into the splice sleeve barrel until it hits the barrel stop.
   - Close the handles of the crimp tool tightly until the crimper handles open when released. The crimper handles will not open until you apply the proper amount of pressure to the splice sleeve. Repeat steps 4 and 5 for the opposite end of the splice.



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6. Shrink the Insulation Around the Splice.
   - Using the heat torch, apply heat to the crimped area of the barrel.
   - Gradually move the heat barrel to the open end of the tubing.
     - The tubing will shrink completely as the heat is moved along the insulation.
     - A small amount of sealant will come out of the end of the tubing when sufficient shrinkage is achieved.

Crimp and Seal Splice Table

Splice Sleeve Color	Crimp Tool Nest Color	Wire Gauge mm^2 / (AWG)
Salmon (yellow-pink)	Red (1)	0.5–0.8 / (18–20)
Blue	Blue (2)	1.0–2.0 / (14–16)
Yellow	Yellow (3)	3.0–5.0 / (10–12)

SIR System Wire Splice Repair

Apply a new splice (not sealed) from the *J 38125-A* Terminal Repair Kit if damage occurs to any of the original equipment splices (three wires or more) in the SIR wiring harness. Carefully follow the instructions included in the kit for proper splice clip application.

Connector Position Assurance (CPA)

The Connector Position Assurance (CPA) is a small plastic insert that fits through the locking tabs of all the SIR system electrical connectors. The CPA ensures that the connector halves cannot vibrate apart. You must have the CPA in place in order to ensure good contact between the SIR mating terminals.

Terminal Position Assurance (TPA)

The Terminal Position Assurance (TPA) insert resembles the plastic combs used in the control module connectors. The TPA keeps the terminal securely seated in the connector body. Do not remove the TPA from the connector body unless you remove a terminal for replacement.

Repairs and Inspections Required After an Accident

Accident With or Without Air Bag Deployment — Component Inspections

Caution: Proper operation of the Supplemental Inflatable Restraint (SIR) sensing system requires that any repairs to the vehicle structure return the vehicle structure to the original production configuration. Not properly repairing the vehicle structure could cause non-deployment of the air bag(s) in a frontal collision or deployment of the air bag(s) for conditions less severe than intended.

After any collision, inspect the following components as indicated. If you detect any damage, replace the component. If you detect any damage to the mounting points or mounting hardware, repair the component or replace the hardware as needed.

- Steering column—Perform the steering column accident damage checking procedures. Refer to Steering Wheel and Column.
- IP Knee Bolsters—Inspect the knee bolsters for bending, twisting, buckling, or any other type of damage.
- IP brackets, braces, etc.—Inspect for bending, twisting, buckling, or any other type of damage.
- Seat Belts—Perform the seat belt operational and functional checks.

Accident With Air Bag Deployment — Component Replacement and Inspections

After a collision involving air bag deployment, replace the following components. If you detect any damage to the mounting points or mounting hardware, repair or replace the mounting points and mounting hardware as needed.

- Inflatable restraint IP (inflator) module
- Inflatable restraint steering wheel (inflator) module
- Inflatable restraint Sensing and Diagnostic Module (SDM)
- The inflatable restraint front end discriminating sensor.

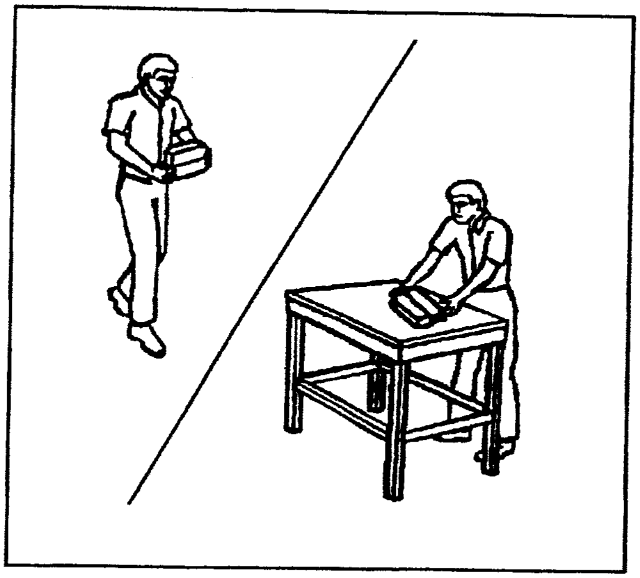
After a collision involving air bag deployment, inspect the Inflatable restraint steering wheel module coil and the coil wiring pigtail for melting, scorching, or other damage due to excessive heat. Perform this component inspection in addition to the inspections indicated above in Accident With or Without Air Bag Deployment. If you detect any damage, replace the component. If you detect any damage to the mounting points or mounting hardware, repair the component or replace the hardware as needed.

Sensor Replacement Guidelines

The SIR sensor replacement policy requires replacing sensors in the area of accident damage. The area of accident damage is defined as the portion of the vehicle which is crushed, bent, or damaged due to a collision. For example, a moderate collision where the front of the vehicle impacts a tree. If the vehicle has a SIR sensor mounted forward of the radiator, it must be replaced.

- Replace the sensor whether or not the air bags have deployed.
- Replace the sensor even if it appears to be undamaged.

Sensor damage which is not visible, such as slight bending of the mounting bracket or cuts in the wire insulation, can cause improper operation of the SIR sensing system. Do not try to determine whether the sensor is undamaged, replace the sensor. Also, if you follow a Diagnostic Trouble Code (DTC) table and a malfunctioning sensor is indicated, replace the sensor.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Inflator Module Handling, Shipping, and Scrapping

Caution: When you are carrying an undeployed inflator module:

- ***Do not carry the inflator module by the wires or connector on the inflator module***
- ***Make sure the bag opening points away from you***

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

Live (Undeployed) Inflator Module

Take special care when handling or storing a live (undeployed) inflator module. An air bag deployment produces rapid gas generation. This may cause the inflator module, or an object in front of the inflator module, to jettison through the air in the event of an unlikely deployment.

Shipping Procedures

Refer to the latest service bulletins for proper SIR inflator module shipping procedures.

Scrapping Procedure

During the course of a vehicle's useful life, certain situations may arise which will necessitate the disposal of a live (undeployed) inflator module. The following information covers the proper procedures for the disposing of a live inflator module. Deploy the inflator module before disposal. Do not dispose of the module through normal disposal channels.

Caution: In order to prevent accidental deployment of the air bag which could cause personal injury, do not dispose of an undeployed inflator module as normal shop waste. The undeployed inflator module contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to dispose of an inflator module as instructed may be a violation of federal, state, province, or local laws.

Do not deploy an air bag in the following situations:

- After replacement of an inflator module under warranty. The module may need to be returned undeployed to the Delphi Interior & Lighting Group. Refer to the latest service bulletin regarding SIR shipping procedures.
- If the vehicle is the subject of a Product Liability report related to the SIR system and is subject to a Preliminary Investigation (GM-1241). Do not alter the SIR system in any manner. Refer to the latest service bulletin on SIR shipping procedures.
- If the vehicle is involved in a campaign affecting the inflator modules. Follow the instructions in the Campaign Service Bulletin for proper SIR handling and shipping procedures.

Deployment Procedures

The inflator module can be deployed inside or outside of the vehicle. The method used depends upon the final disposition of the vehicle. Review the following procedures in order to determine which will work best in a given situation:

Deployment Outside Vehicle (Inflatable Restraint Steering Wheel Module)

Tools Required

- *J 38826* SIR Deployment Harness
- An appropriate pigtail adapter

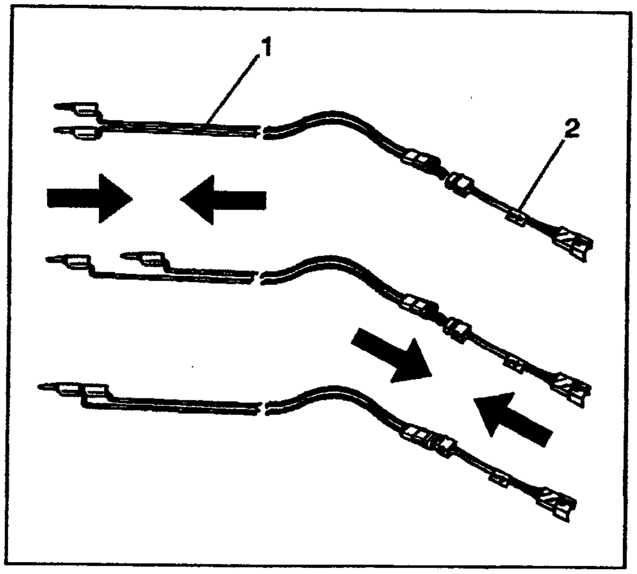
Caution: In order to prevent accidental deployment of the air bag which could cause personal injury, do not dispose of an undeployed inflator module as normal shop waste. The undeployed inflator module contains substances that could cause severe illness or personal injury if the sealed container is damaged during disposal. Use the following deployment procedures to safely dispose of an undeployed inflator module. Failure to dispose of an inflator module as instructed may be a violation of federal, state, province, or local laws.

Caution: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

Deploy the inflatable restraint steering wheel inflator module outside of the vehicle when the vehicle will be returned to service. Situations that require deployment outside of the vehicle include the following:

- Using the SIR diagnostics, you determine that the inflator module does not function properly.
- The inflator module is scratched or ripped on the cover.
- The inflator module pigtail (if equipped) is damaged.
- The inflator module connector is damaged.
- An inflator module connector terminal is damaged.

Deployment and disposal of a malfunctioning inflator module is subject to any required retention period.



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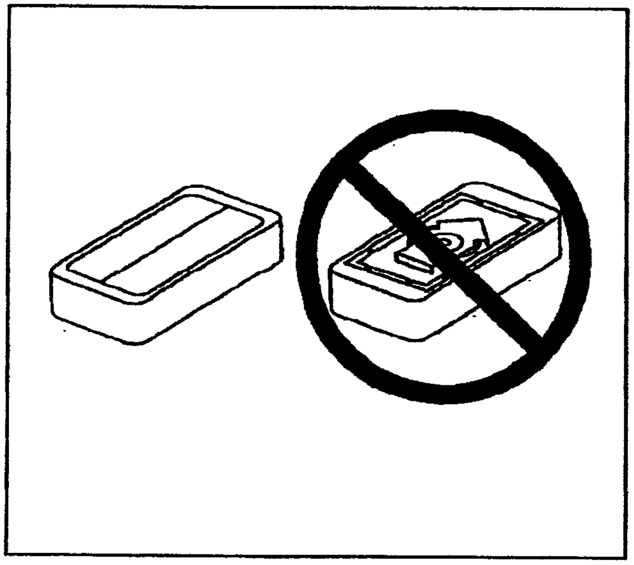
1. Turn the ignition switch to the OFF position.
2. Remove the ignition key.
3. Put on safety glasses.
4. Inspect the *J 38826* and the appropriate pigtail adapter for damage. Replace as needed.
5. Short the two SIR deployment harness (1) leads together using one banana plug seated into the other.
6. Connect the appropriate pigtail adapter (2) to the SIR deployment harness (1).
7. Remove the inflatable restraint steering wheel module. Refer to *Infl Rst Steering Wheel Module Replacement* in Steering Wheel And Column.
8. Remove the horn lead from the back of the module, if equipped.
9. Remove the redundant steering wheel control leads from the back of the module, if equipped.
10. Remove all horn/steering wheel control buttons from the module, if equipped.



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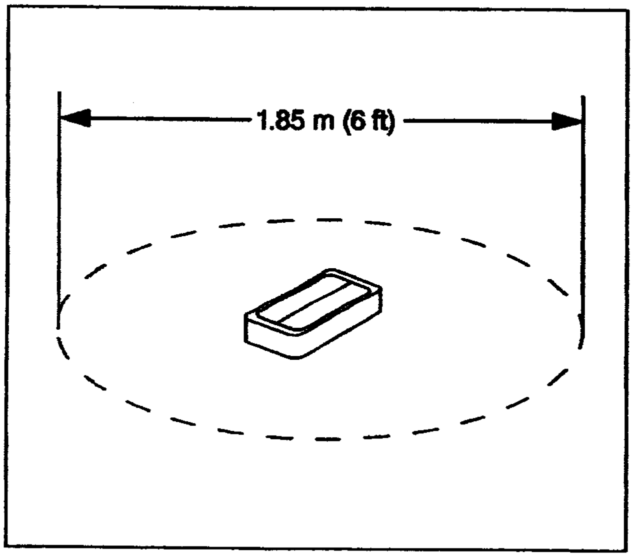
Caution: When you are carrying an undeployed inflator module:

- ***Do not carry the inflator module by the wires or connector on the inflator module***
- ***Make sure the bag opening points away from you***

When you are storing an undeployed inflator module, make sure the bag opening points away from the surface on which the inflator module rests. When you are storing a steering column, do not rest the column with the bag opening facing down and the column vertical. Provide free space for the air bag to expand in case of an accidental deployment. Otherwise, personal injury may result.

11. Place the module with the vinyl trim cover facing up and away from the surface on a work bench.



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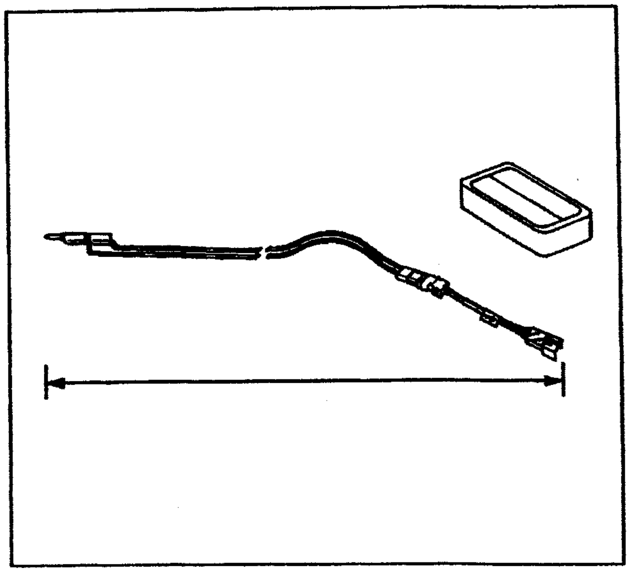
12. Clear a space on the ground about 1.85 M (6 ft) in diameter for deployment of the module. If possible, use a paved, outdoor location free of activity. Otherwise, use a space free of activity on the shop floor. Make sure you have sufficient ventilation.
13. Make sure no loose or flammable objects are in the area.
14. Place the module in the space with the vinyl trim cover facing up.

15. Extend the SIR deployment harness and adapter to full length from the module.
16. Place a 12V minimum/2A minimum power source (i.e., vehicle battery) near the shorted end of the harness.



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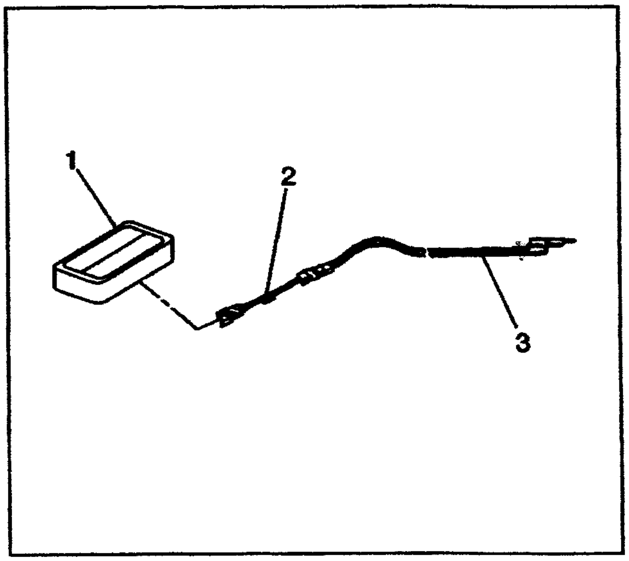
17. Connect the module (1) to the adapter (2) on the SIR deployment harness (3).
18. Firmly seat the adapter into the module connector.
19. Clear the area of people.



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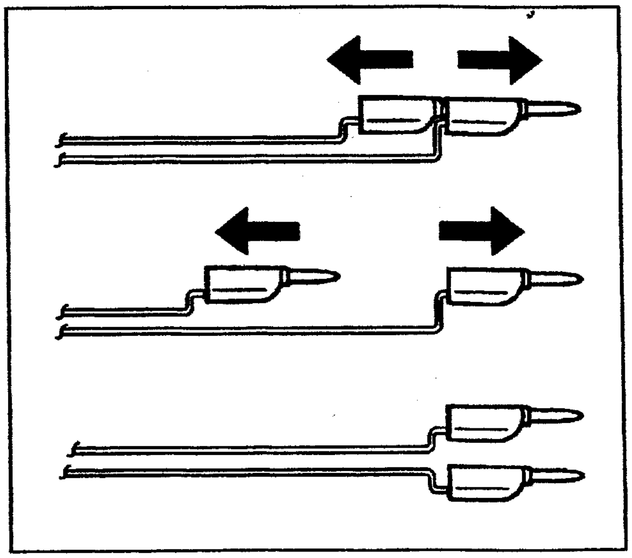
Caution: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

20. Separate the two banana plugs on the SIR deployment harness.



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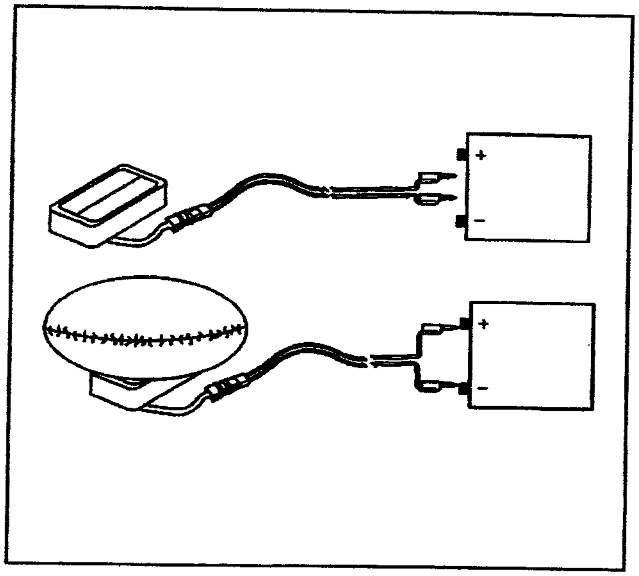

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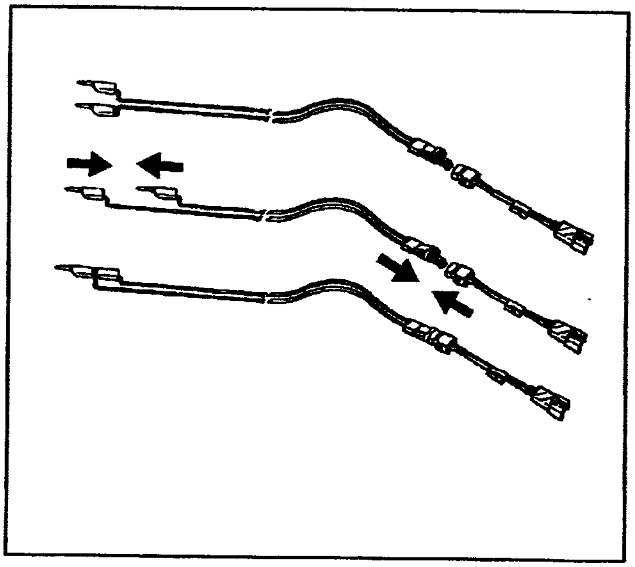
Important: The rapid gas expansion involved with deploying an air bag is very loud. Notify all the people in the immediate area that you intend to deploy the inflator module

Important: When the air bag deploys, the inflator module may jump about 30 cm (1 ft) vertically. This is a normal reaction of the inflator module to the force of the rapid gas expansion inside the air bag.

21. Connect the SIR deployment harness wires to the power source.



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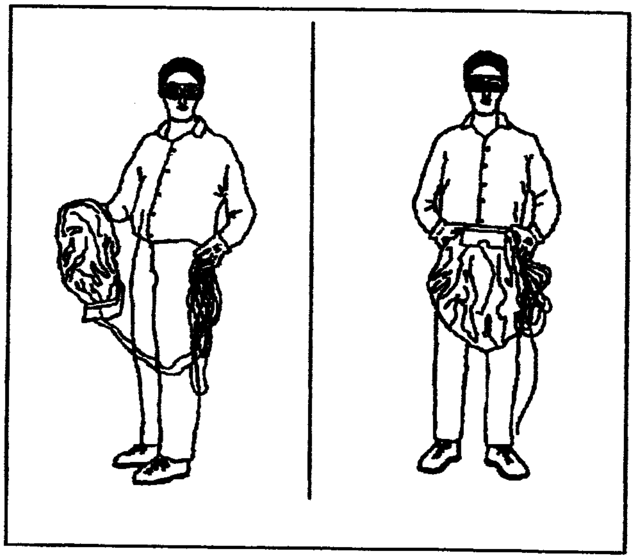
22. Disconnect the SIR deployment harness from the power source after the air bag deploys.
23. Seat one banana plug into the other in order to short the deployment harness leads.
24. If the air bag did not deploy, disconnect the adapter and discontinue the procedure. Contact the Technical Assistance Group. Otherwise, proceed to the following steps.



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Caution: Immediately following the deployment of an air bag, the metal surfaces of the inflator module are very hot. Do not place the deployed inflator module near any flammable objects. Wait for about ten minutes before touching any metal surface of the inflator module. Disregarding these precautions may cause fire or personal injury.

25. Put on a pair of shop gloves.
26. Disconnect the pigtail adapter from the inflator module as soon as possible.
27. Inspect the pigtail adapter and the SIR deployment harness. Replace as needed.
28. Dispose of the deployed module through normal refuse channels.
29. Wash hands with a mild soap.

Deployment Outside Vehicle (Inflatable Restraint IP Module)

Dealers should refer to the latest General Motors Service Bulletins for live (undeployed) inflatable restraint IP module scrapping and disposal procedures. All others should contact a local General Motors dealer for these procedures. Dispose of deployed IP modules through normal refuse channels.

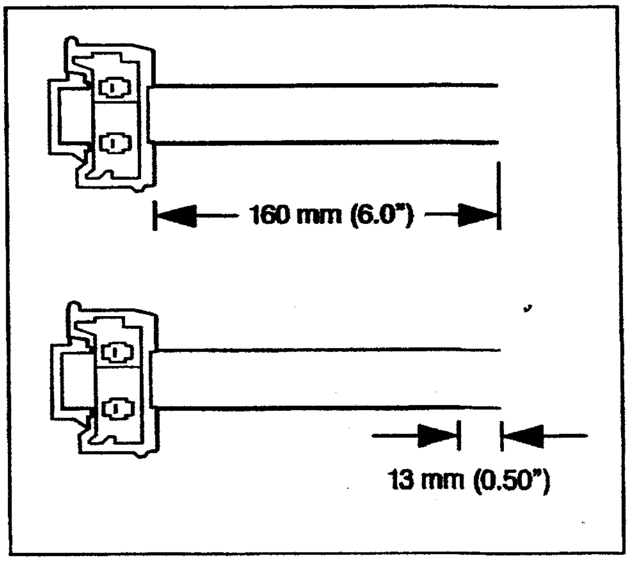
Deployment Inside Vehicle (Vehicle Scrapping Procedure)

Deploy the inflator modules inside of the vehicle when destroying the vehicle or when salvaging the vehicle for parts. This includes but is not limited to the following situations:

- The vehicle has completed its useful life.
- Irreparable damage occurs to the vehicle in a non-deployment type accident.
- Irreparable damage occurs to the vehicle during a theft.
- The vehicle is being salvaged for parts to be used on a vehicle with a different VIN as opposed to rebuilding as the same VIN.

Caution: When you are deploying an inflator module for disposal, perform the deployment procedures in the order listed. Failure to follow the procedures in the order listed may result in personal injury.

1. Turn the ignition switch to the OFF position.
2. Remove the ignition key.
3. Put on safety glasses.
4. Remove all loose objects from the front seats.
5. Disconnect the inflatable restraint steering wheel module yellow 2-way connector.
6. Cut the yellow 2-way harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
7. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.



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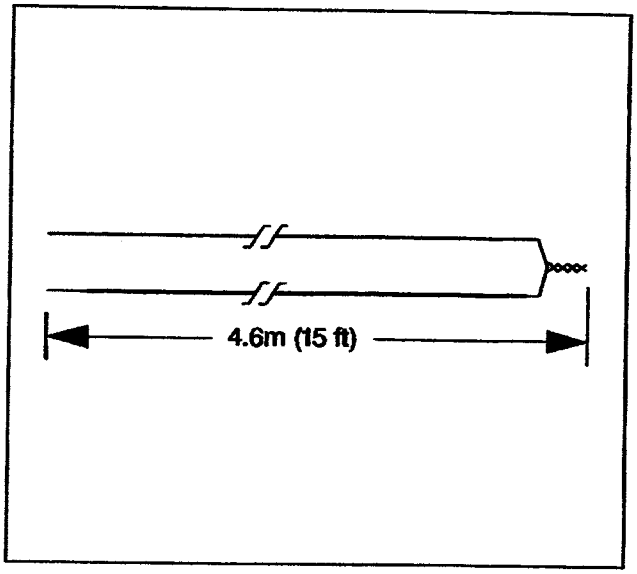

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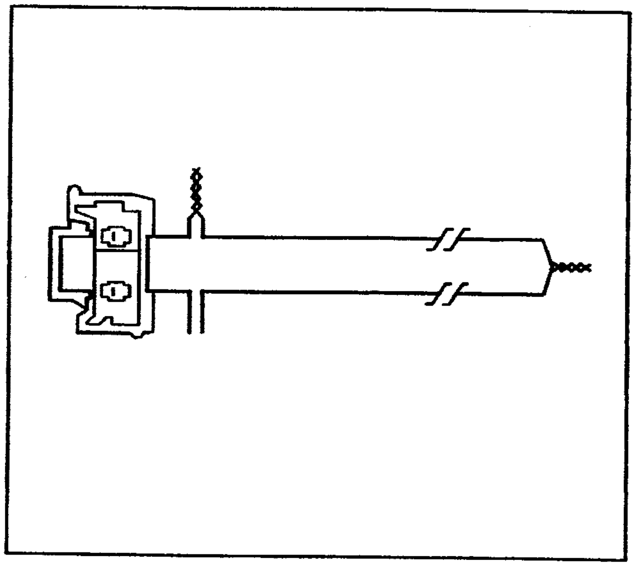
8. Cut two 4.6 M (15 ft) deployment wires from a 0.8 mm (18 gage) or thicker multi-strand wire. Use these wires to fabricate the driver deployment harness.
9. Strip 13 mm (0.5 in) of insulation from both ends of the wires cut in the previous step.
10. Twist together one end from each of the wires in order to short the wires. Deployment wires shall remain shorted, and not connected to a power source until you are ready to deploy the air bag.



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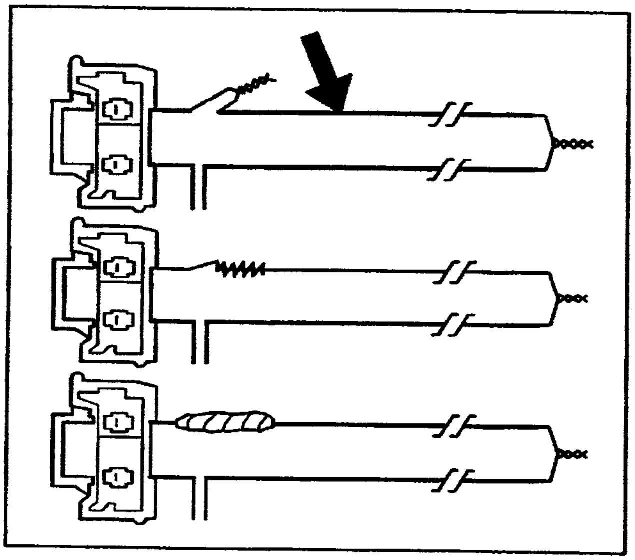
11. Twist together one connector wire lead to one deployment wire.
12. Inspect that the previous connection is secure.



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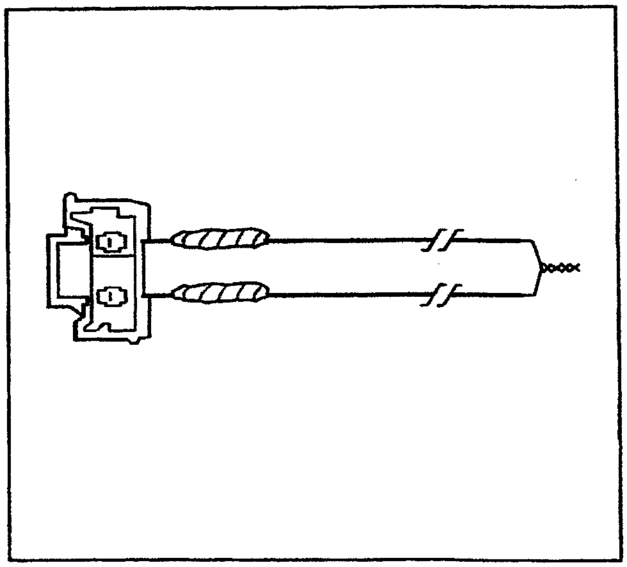
13. Bend flat the twisted connection.
14. Secure and insulate the connection using electrical tape.

15. Twist together, bend, and tape the remaining connector wire lead to the remaining deployment wire.
16. Connect the deployment harness to the inflatable restraint steering wheel module yellow 2-way connector.



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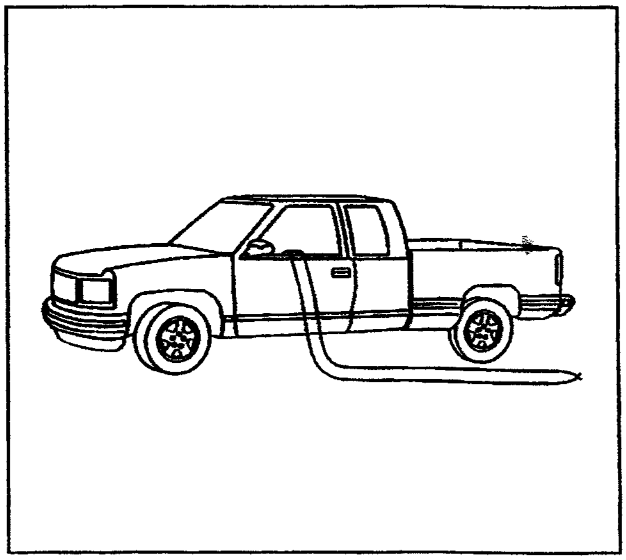
17. Route the deployment harness out of the vehicle's driver side.



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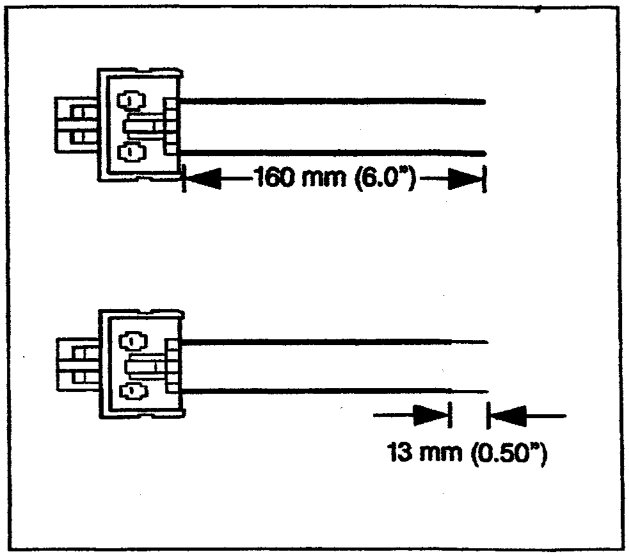
18. Disconnect the inflatable restraint IP module yellow 2-way harness connector.
19. Cut the harness connector out of the vehicle, leaving at least 16 cm (6 in) of wire at the connector.
20. Strip 13 mm (0.5 in) of insulation from each of the connector wire leads.



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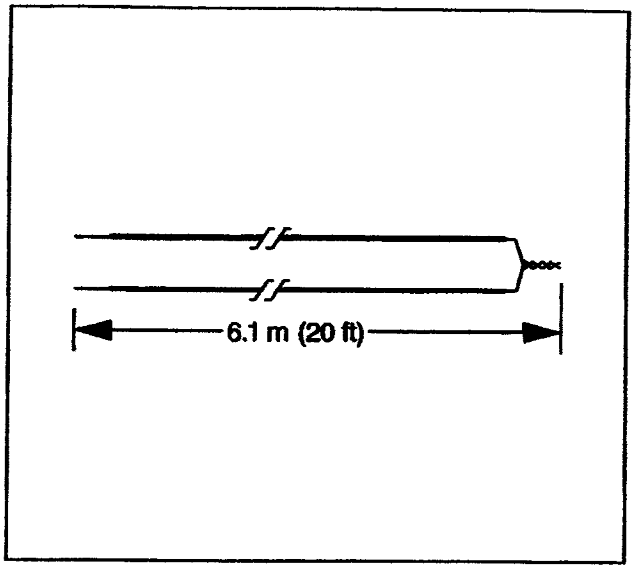

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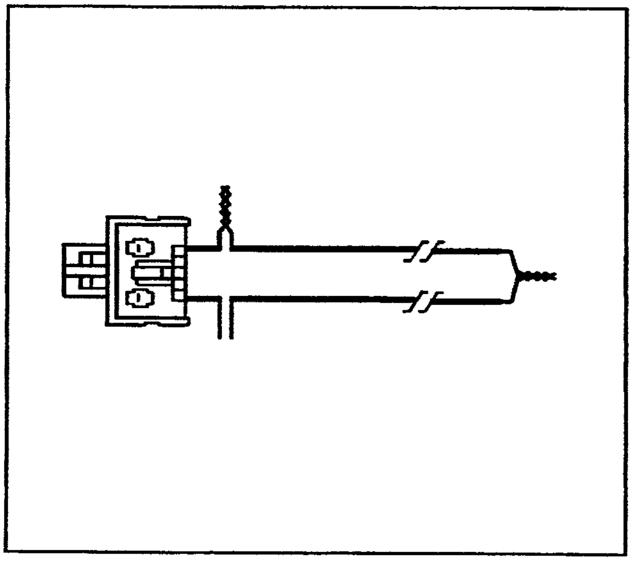
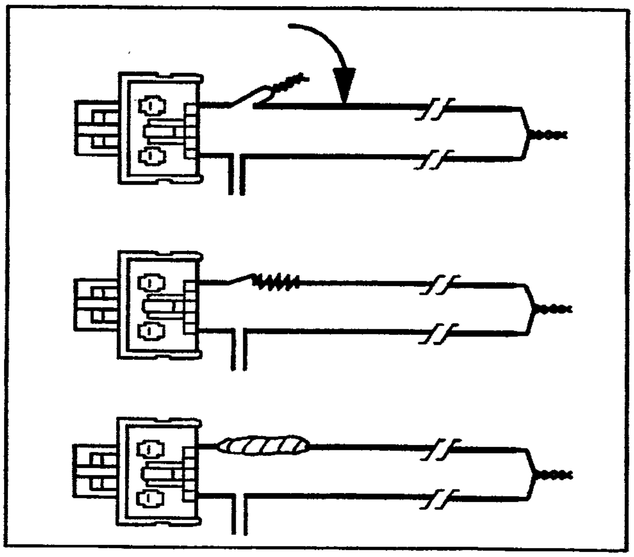
21. Cut two 6.1 M (20 ft) deployment wires from a 0.8 mm (18 gage) or thicker multi-strand wire. These wires will be used to fabricate the passenger deployment harness.
22. Strip 13 mm (0.5 in) of insulation from both ends of the wires cut in the previous step.
23. Twist together one end from each of the wires in order to short the wires.



68652

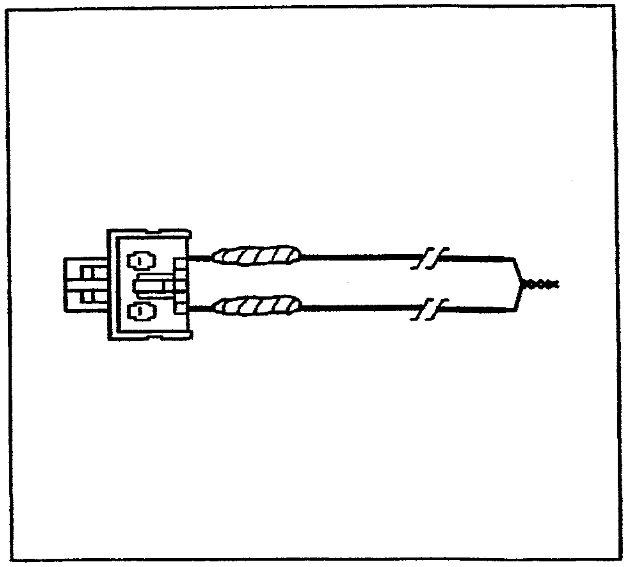
24. Twist together one connector wire lead to one deployment wire.



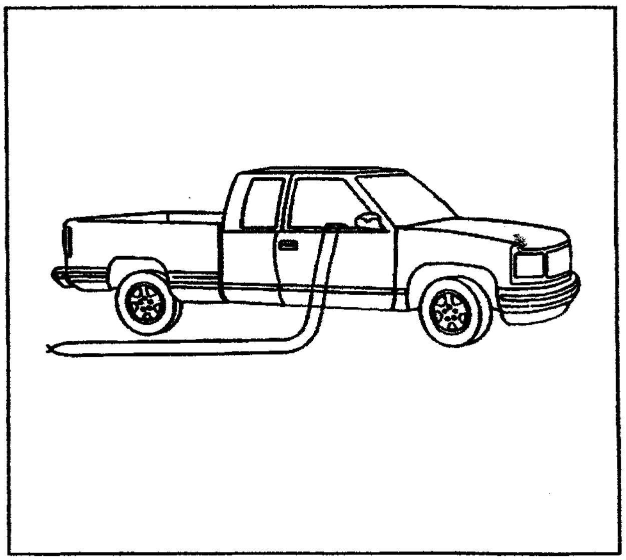
68660

25. Bend flat the twisted connection.
26. Secure and insulate the connection using electrical tape.

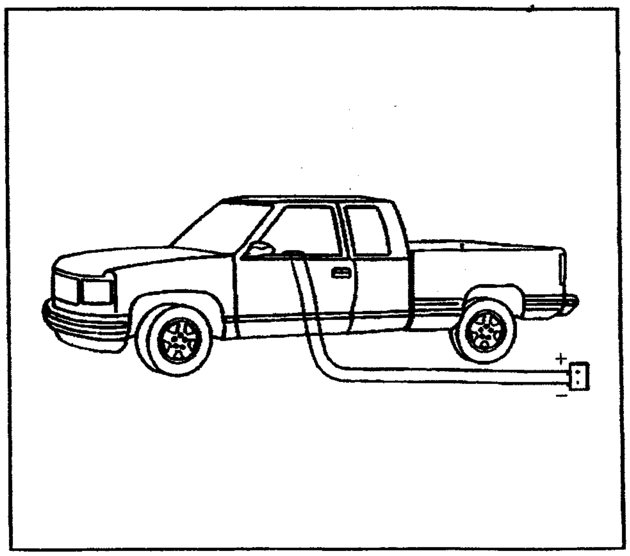
27. Twist together, bend, and tape the remaining connector wire lead to the remaining deployment wire.
28. Connect the deployment harness to the inflatable restraint IP module yellow 2-way connector.

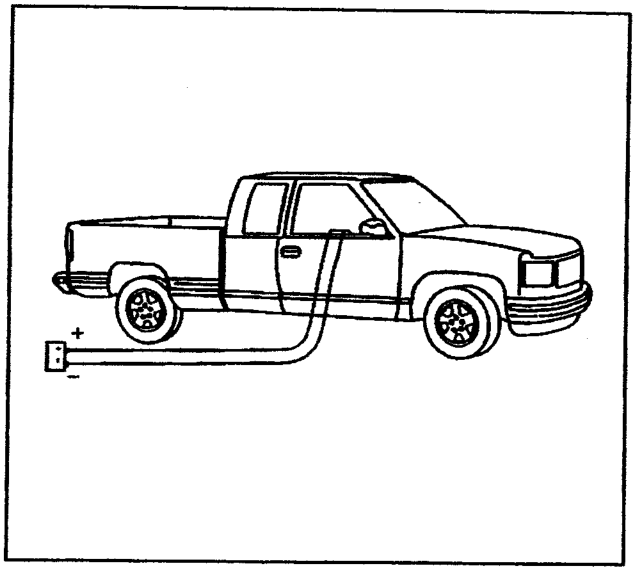


29. Route the deployment harness out of the passenger side of the vehicle.
30. Clear the inside and outside of the vehicle of any people or loose and flammable objects.
31. Stretch the driver harness to full length.
32. Stretch the passenger harness to full length.
33. Completely cover the windshield and front door window openings with a drop cloth.



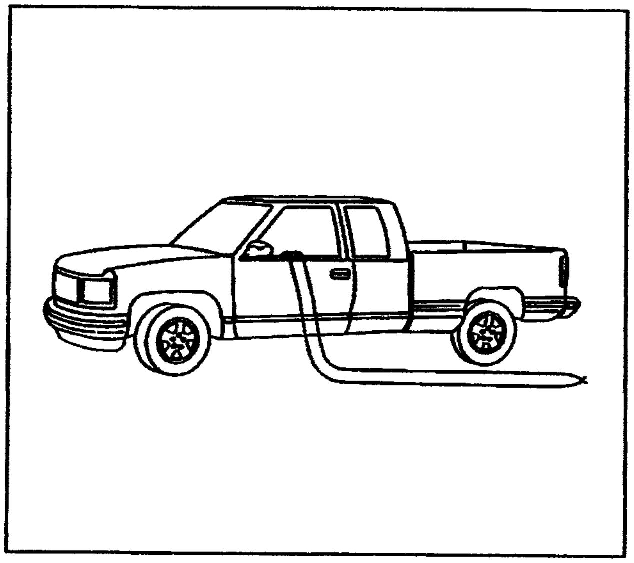
34. Place a power source, 12 V minimum 2 A minimum (i.e., a vehicle battery) near the shorted end of the harness.
35. Separate the two ends of the driver deployment harness wires.
36. Connect the driver deployment harness wires to the power source in order to deploy the inflatable restraint steering wheel module.
37. Disconnect the driver deployment harness wires from the power source.





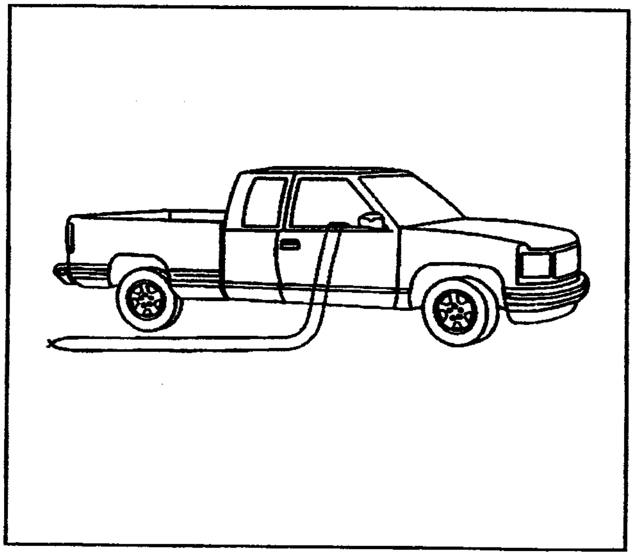
188435

38. Separate the two ends of the passenger deployment harness wires.
39. Connect the passenger deployment harness wires to the power source in order to deploy the inflatable restraint IP module.
40. Disconnect the passenger deployment harness wires from the power source.



188444

41. Twist together one end of each wire on the driver deployment harness in order to short the wires.



188440

42. Twist together one end of each wire on the passenger deployment harness in order to short the wires.
43. Remove the drop cloth from the vehicle.
44. Disconnect both harnesses from the vehicle.
45. Discard the harnesses.
46. Scrap the vehicle in the same manner as a non-SIR equipped vehicle.
47. If one or both of the modules did not deploy, perform the following steps:
    - 47.1. Remove the undeployed module(s) from the vehicle. Refer to *Infl Rst Steering Wheel Module Replacement* and *Infl Rst Instrument Panel Module Replacement*.
    - 47.2. Temporarily store the module(s).
    - 47.3. Call the Technical Assistance Group for further assistance.

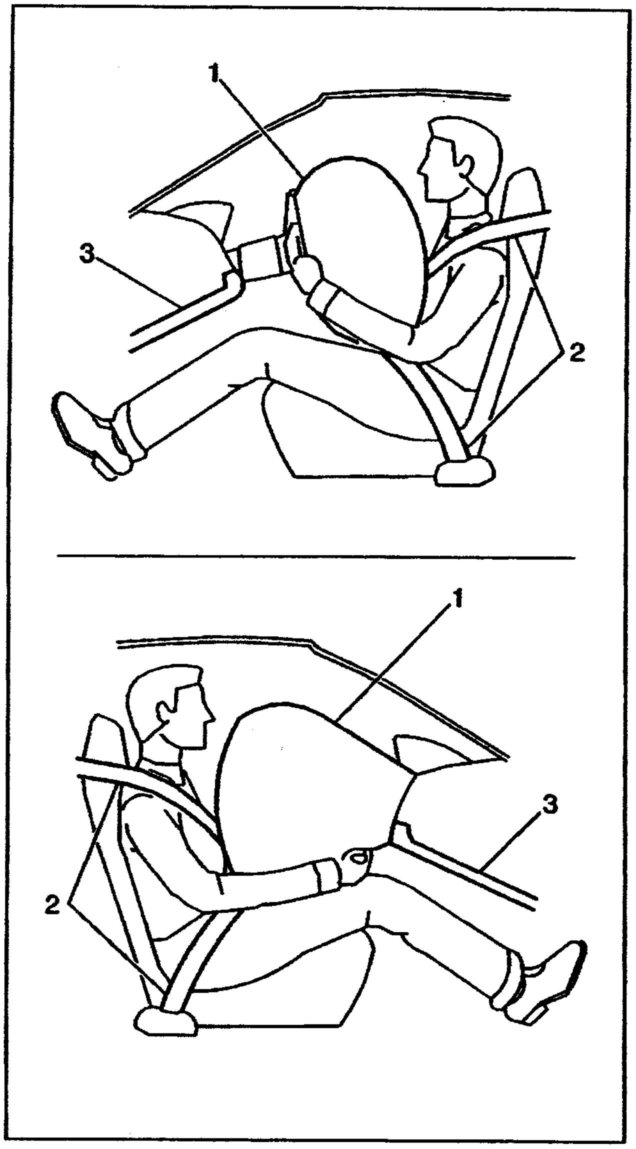
Handling a Deployed Inflatable Restraint Steering Wheel Inflator Module

After the inflator module has deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates), and by-products of the chemical reaction. The deployment reaction produces sodium hydroxide dust (similar to lye soap). The sodium hydroxide quickly reacts with the atmospheric moisture. This atmospheric moisture converts the sodium hydroxide into sodium carbonate and sodium bicarbonate (baking soda). Therefore, you will probably find no sodium hydroxide present after the deployment. Gloves and safety glasses are recommended, however, as a precaution. Gloves and safety glasses help to prevent possible irritation of the skin or eyes.

Description and Operation

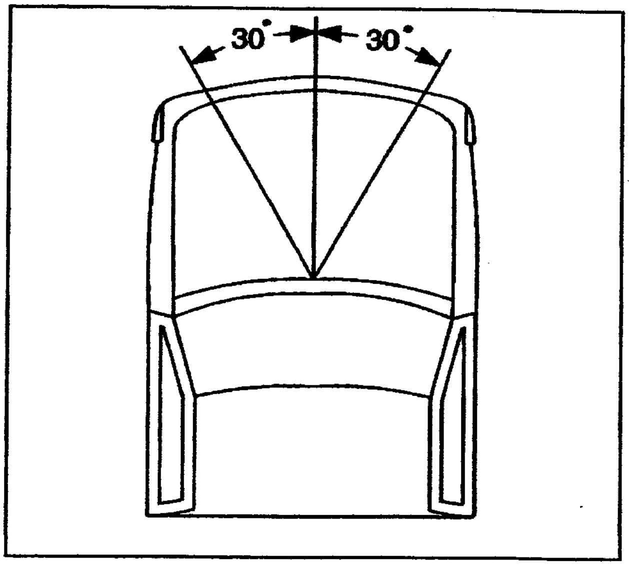
SIR System Operation

Restraint Devices



The Supplemental Inflatable Restraint (SIR) system supplements the protection offered by the driver and front passenger seat belts (2). The SIR system deploys an air bag (1) from the center of the steering wheel and from the right side of the instrument panel.

The knee bolsters (3) and the steering column absorb crash energy. The driver and passenger knee bolsters are below the instrument panel.



A frontal crash of sufficient force up to 30 degrees off the centerline of the vehicle will deploy the air bags.

System Description

The SIR system consists of the following components:

- Inflatable Restraint Sensing and Diagnostic Module (SDM)
- Inflatable Restraint Steering Wheel Module
- Inflatable Restraint Steering Wheel Module Coil
- Inflatable Restraint IP Module
- Inflatable Restraint IP Module Switch
- Inflatable Restraint Front End Discriminating Sensor
- AIR BAG warning lamp in the instrument cluster

The inflatable restraint Sensing and Diagnostic Module (SDM), inflatable restraint steering wheel module coil (SIR coil assembly), inflatable restraint steering wheel module (driver inflator module), inflatable restraint IP module (passenger inflator module), and connector wires make up the deployment loops. The function of the deployment loops is to supply current through the inflator modules, which will cause deployment of the air bags. Deployment occurs when the SDM detects vehicle velocity changes severe enough to warrant deployment.

The SDM contains a sensing device (Accelerometer) that converts vehicle velocity changes to an electrical signal. The SDM compares this electrical signal to a value stored in memory. When the generated signal exceeds the stored value, the SDM performs additional signal processing and compares the generated signals to values stored in memory. When two of the generated signals exceed the stored values, the SDM will cause current to flow through the inflator modules, deploying the air bags.

An auxiliary inflatable restraint front end discriminating sensor assists the SDM in determining when a deployment should occur by providing an input signal to the SDM.

The IP Module switch is directly interfaced to the inflatable restraint Sensing and Diagnostic Module (SDM). The SDM senses the state of the IP Module switch. When the switch is in the ON position, the SDM enables possible deployment of the inflatable restraint IP module. When the switch is in the OFF position, the SDM disables or inhibits possible deployment of the inflatable restraint IP module.

SIR System Component Description and Definitions

Inflatable Restraint Sensing and Diagnostic Module

The inflatable restraint Sensing and Diagnostic Module (SDM) performs the following functions in the SIR system:

- Energy Reserve – The SDM maintains 23 Volt Loop Reserve (23 VLR) energy supplies to provide deployment energy. Ignition voltage can provide deployment energy if the 23 Volt Loop Reserves malfunction.
- Frontal Crash Detection – The SDM monitors vehicle velocity changes to detect frontal crashes that are severe enough to warrant deployment.
- Air Bag Deployment – During a frontal crash of sufficient force, the SDM will cause enough current to flow through the inflator modules to deploy the air bags.
- Frontal Crash Recording – The SDM records information regarding the SIR system status during a frontal crash.
- Malfunction Detection – The SDM performs diagnostic monitoring of the SIR system electrical components. Upon detection of a circuit malfunction, the SDM will set a Diagnostic Trouble Code (DTC).
- Malfunction Diagnosis – The SDM displays SIR Diagnostic Trouble Codes and system status information through the use of a scan tool.
- Driver Notification – The SDM warns the vehicle driver of SIR system malfunctions by controlling the AIR BAG warning lamp.

The SDM connects to the SIR wiring harness using a 12-way connector. The SDM harness connector uses a shorting bar across certain terminals in the contact area. Removal of the SDM Connector Position Assurance (CPA) or the harness connector itself will connect the AIR BAG warning lamp to ground through the shorting bar.

The AIR BAG warning lamp will come ON steady with power applied to the SDM when either one of the following two conditions exist:

- You remove the SDM CPA.
- You disconnect the SDM harness connector.

The SDM receives power whenever the ignition switch is in the ON position.

AIR BAG Warning Lamp

The ignition switch applies ignition voltage to the AIR BAG warning lamp. The AIR BAG warning lamp receives power whenever the ignition switch is at the ON position. The inflatable restraint Sensing and Diagnostic Module (SDM) controls the lamp by providing ground with a lamp driver. The SIR system uses the AIR BAG warning lamp to do the following:

- Verify lamp and SDM operation by flashing the lamp seven times when the ignition switch is first turned to the ON position.
- Warn the vehicle driver of SIR electrical system malfunctions which could potentially affect the operation of the SIR system. These malfunctions could result in either of the following conditions:
  - Non-deployment in the case of a frontal crash
  - Deployment for conditions less severe than intended

The AIR BAG warning lamp is the key to driver notification of SIR system malfunctions. Refer to *SIR Diagnostic System Check* for proper lamp operation.

The AIR BAG warning lamp is two Light Emitting Diodes (LED). The LEDs are not serviceable. Refer to Instrument Cluster Replacement in Instrument Panel And Gauges for replacement of the Instrument Cluster.

Inflatable Restraint Steering Wheel Module Coil

The inflatable restraint steering wheel module coil consists of two or more current-carrying coils. The inflatable restraint steering wheel module coil attaches to the steering column. Two of the current-carrying coils allow rotation of the steering wheel while maintaining continuous contact of the driver deployment loop to the inflatable restraint steering wheel module.

There is a shorting bar on the yellow 2-way connector near the base of the steering column that connects the inflatable restraint steering wheel module coil to the SIR wiring harness. The shorting bar shorts the circuits to the inflatable restraint steering wheel module coil and inflatable restraint steering wheel module during the disconnection of the yellow 2-way connector. The shorting of the inflatable restraint steering wheel module coil and inflatable restraint steering wheel module circuitry will help prevent unwanted deployment of the air bag when servicing the steering column or other SIR system components.

Inflator Modules

The inflator modules consist of an inflatable bag and an inflator. An inflator consists of a canister of gas-generating material and an initiating device. The initiator is part of the deployment loop. When the vehicle is in a frontal crash of sufficient force, the inflatable restraint Sensing and Diagnostic Module (SDM) causes current to flow through the deployment loops. Current passing through the initiator ignites the material in the inflator module. The gas produced from this reaction rapidly inflates the air bag.

There is a shorting bar on the inflatable restraint steering wheel module side of the upper steering column connector that connects the inflatable restraint steering wheel module coil to the inflatable restraint steering wheel module. The shorting bar shorts across the inflatable restraint steering wheel module circuits during the disconnection of the upper steering column connector. The shorting of the inflatable restraint steering wheel module circuitry will help prevent unwanted deployment of the air bag when servicing the inflatable restraint steering wheel module, the steering column or other SIR system components.

There is a shorting bar on the inflatable restraint IP module connector that connects to the SIR wiring harness. The shorting bar shorts across the inflatable restraint IP module circuits during the disconnection of the inflatable restraint IP module connector. The shorting of the inflatable restraint IP module circuitry will help prevent unwanted deployment of the air bag when servicing the inflatable restraint IP module, the instrument panel or other SIR system components.

In the event of a fault in the inflatable restraint IP module switch circuitry, the SDM will detect the fault and set Diagnostic Trouble Code (DTC) B1054, the SDM will attempt to illuminate the AIR-BAG OFF lamp, the AIR BAG warning lamp will turn ON and the inflatable restraint IP module will default to the suppressed (disabled) state.

Inflatable Restraint IP Module Switch

The Inflatable Restraint IP Module Switch is a manual two-position key switch located in the instrument panel, to the right of the steering wheel. This switch gives the vehicle operator the ability to enable or disable inflatable restraint IP module (Passenger Front Air Bag) deployment should the vehicle be involved in a severe frontal collision. The vehicle operator may choose to disable the inflatable restraint IP module if there is no occupant in the front seat, or if there is a child in a rear-facing child seat in the front seat.

The manual key-switch operates in two positions. When the key is vertical, the switch is in the OFF position and the inflatable restraint IP module is in the suppressed (disabled) state. In the suppressed state, the inflatable restraint IP module will not deploy in the event of a severe frontal collision. When the key is horizontal, the switch is in the ON position and the inflatable restraint IP module is in the nonsuppressed (enabled) state. In the nonsuppressed state, the inflatable restraint IP module will deploy in the event of a severe frontal collision. The key—switch assembly also includes a backlit switch cover which illuminates when the headlights are on.

The IP Module switch is directly interfaced to the inflatable restraint Sensing and Diagnostic Module (SDM). The SDM senses the state of the IP Module switch. When the switch is in the ON position, the SDM enables possible deployment of the inflatable restraint IP module. When the switch is in the OFF position, the SDM disables or inhibits possible deployment of the inflatable restraint IP module.

Inflatable Restraint Front End Discriminating Sensor

The presence of an inflatable restraint front end discriminating sensor enhances the SIR system performance. Use of the inflatable restraint front end discriminating sensor provides timely deployment of the air bags during some crashes. Although this is a mechanical sensor, it is not a part of the deployment loop but instead only provides an input signal to the inflatable restraint Sensing and Diagnostic Module (SDM).

Steering Column

The steering column is energy absorbing. The steering column can compress during a frontal crash in order to decrease the chance of injury to the driver.

Knee Bolster

The knee bolsters absorb energy and control the forward movement of the vehicle's front seat occupants during a frontal crash, by limiting leg movement.

Definitions

Air Bag: An inflatable cloth cushion designed to deploy in certain frontal crashes. The air bags distribute the impact load more evenly over the occupant's head and torso in order to supplement the safety belt protection.

Asynchronous: An event that can occur at any time without a warning and without falling within a defined time period.

B+: The battery voltage available at the time of the indicated measurement. With the ignition switch in the ON position and the engine stopped, the voltage is usually 11.5 -12.5 V. With the engine at idle, the voltage may be 14.0 -16.0 V. During engine cranking, the voltage can be as low as 10.0 V.

Bulb Test: The inflatable restraint Sensing and Diagnostic Module (SDM) will cause the air bag warning indicator to flash 7 times. Under normal operation, this occurs when the ignition is turned from the OFF position to the ON position. The bulb test will also occur if the IGNITION 1 voltage exceeds 17.1 V and then returns within the normal operating voltage range. A malfunction could prevent the module from flashing the indicator.

Continuous Monitoring Test: The inflatable restraint Sensing and Diagnostic Module (SDM) continuously monitors the SIR system during each 100 millisecond interval. The IGNITION 1 voltage at the module must be with the normal operating voltage range for the continuous monitoring to occur. These tests follow the power-on tests.

Data Link Connector (DLC): The DLC electrically connects to many on-board computers and allows communication with an off-board computer such as a scan tool.

Datum Line: A base line parallel to the plane of the vehicle underbody or the frame. All vertical measurements originate from this base line.

Deploy: To inflate the air bag.

Deployment Loop Continuity Test: The inflatable restraint Sensing and Diagnostic Module (SDM) performs this test in order to inspect for voltage variations in the DRIVER SIDE HIGH/LOW and the PASSENGER SIDE HIGH/LOW circuitry. The module first measures the IGNITION 1 and the 23 VLR in order to verify that the voltage is within specifications. The module then performs the deployment loop continuity test. Detection of a malfunction during these tests may prevent the resistance measurement test from occurring until the next ignition cycle. This test is part of the power-on tests and occurs before the continuous monitoring tests.

Deployment Loops: The circuits that supply the current to the inflator modules for air bag deployment.

Diagnostic Trouble Code (DTC): An alphanumeric designator used by the inflatable restraint Sensing and Diagnostic Module (SDM) in order to indicate specific SIR system malfunctions.

Driver Current Sink: An output of the inflatable restraint Sensing and Diagnostic Module (SDM) that supplies a low resistance path to ground for the inflatable restraint steering wheel module circuit.

Driver Current Source: An output of the inflatable restraint Sensing and Diagnostic Module (SDM) that supplies current into the inflatable restraint steering wheel module circuit.

EEPROM (Electrically Erasable Programmable Read Only Memory) : Memory that does not require power to the inflatable restraint Sensing and Diagnostic Module (SDM) in order to retain its contents.

Higher Priority Fault: Each DTC has an assigned priority based on its detectability with other DTCs present. The priority corresponds to the detectability of the malfunction only. This does not relate to the seriousness of the malfunction with respect to deployment or non deployment under any given condition.

Ignition Cycle: The operation of the ignition switch causes this cycle to occur. The inflatable restraint Sensing and Diagnostic Module (SDM) must first sense IGNITION 1 input greater than 8.2 V with the ignition switch in the ON position. The IGNITION 1 input voltage must remain above 8.2 V for at least 10 seconds before turning the ignition switch to the OFF position.

Ignition 1: A B+ circuit receiving power with the ignition in the ON position or the START position.

Inflatable Restraint Front End Discriminating Sensor: A sensor mounted on the front of the vehicle that supplies an input signal to the inflatable restraint Sensing and Diagnostic Module (SDM).

Inflatable Restraint IP Module: An assembly located on the RH of the IP consisting of an inflatable air bag, an inflator, and an initiator.

Inflatable Restraint IP Module Switch: A manual two-position key switch located in the instrument panel, to the right of the steering wheel. This switch gives the vehicle operator the ability to enable or disable inflatable restraint IP module (Passenger Front Air Bag) deployment should the vehicle be involved in a severe frontal collision. The vehicle operator may choose to disable the inflatable restraint IP module if there is no occupant in the front seat, or if there is a child in a rear-facing child seat in the front seat.

Inflatable Restraint Sensing and Diagnostic Module: The SDM that provides reserve energy to the deployment loops, deploys the air bags when required, and performs diagnostic monitoring of all SIR system components.

Inflatable Restraint Steering Wheel Module: An assembly located in the steering wheel hub consisting of an inflatable bag, an inflator, and an initiator.

Inflatable Restraint Steering Wheel Module Coil: An assembly of two or more current carrying coils mounted within the steering column hub. The assembly allows the rotation of the steering wheel while maintaining continuous electrical circuit contact. Two of the coils provide continuous contact of the driver deployment loop to the inflatable restraint steering wheel module.

Initiator: Located in the inflator module, the initiator initiates the chemical reaction that inflates the air bag when sufficient current flows through the component.

Normal Operating Voltage Range: 8.2-17.1 V when measuring between the inflatable restraint Sensing and Diagnostic Module (SDM) IGNITION 1 terminal and ground.

Passenger Current Sink: An output of the inflatable restraint Sensing and Diagnostic Module (SDM) that supplies a low resistance path to ground for the inflatable restraint IP module circuit.

Passenger Current Source: An output of the inflatable restraint Sensing and Diagnostic Module (SDM) that supplies current into the inflatable restraint IP module circuit.

Power-on Test: Tests that the inflatable restraint Sensing and Diagnostic Module (SDM) performs on the SIR system once per ignition cycle. These tests occur immediately after the module receives IGNITION 1 voltage, and before the continuous monitoring tests.

Resistance Measurement Test: A test that the inflatable restraint Sensing and Diagnostic Module (SDM) performs once per ignition cycle in order to measure the resistance of the deployment loops. The module first measures IGNITION 1, 23 VLR, and the deployment loop voltages in order to verify readings within specifications. The module then sources a constant current into the loop. The module measures the voltage drop across the loop and converts the value to a resistance value. This resistance value is within the range of 0.0 - 6.3 ohms. Upon the detection of an open circuit, the module aborts the tests in order to prevent the calculation of the resistances until the next ignition cycle. This test also checks for proper operation of the driver/passenger current sources. This test is part of the power-on tests and occurs before the continuous monitoring tests.

Scan Tool: An off-board computer that reads on-board computer diagnostic information through the use of a DLC.

Serial Data: The information communicated to an off-board computer using the DLC. Some of this data represents the status of the SIR system.

SIR: Supplemental inflatable restraint.

SIR Wiring Harness: The wires and connectors that electrically connect the components in the SIR system.

23 VLR: The 23 volt loop reserve. The energy supply that is internal to the inflatable restraint Sensing and Diagnostic Module (SDM).

Special Tools Description

J 35616-A Connector Test Adapter Kit

Use J 35616-A Connector Test Adapter Kit whenever a diagnostic procedure requests checking or probing a terminal. Using the appropriate adapter will ensure that no damage to the terminal occurs from the DMM probe, such as spreading or bending. The adapter will also give an idea of whether contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact.

J 38125-A Terminal Repair Kit

Use J 38125-A Terminal Repair Kit for SIR wiring repair. This kit contains a special crimping tool, heat torch, and sealed splices. Do not use the terminals in the kit to replace damaged SIR system terminals unless specifically indicated by the terminal package.

J 38715-A SIR Driver/Passenger Load Tool

Use J 38715-A SIR Driver/Passenger Load Tool only when the SIR diagnostics call for it. The Load Tool is used as a diagnostic aid and a safety device to prevent inadvertent inflator module deployment.

The load tool has four yellow connectors attached to its case. The three small connectors are electrically functional and serve as resistive load substitutions. The large dummy connector does not serve as a load substitution and is not used. Use no more than two connectors at any time.

One of the small connectors is used to substitute the load of the inflatable restraint steering wheel module. It is connected at the top of the column to the inflatable restraint steering wheel module coil. Use one of the following adapters to connect the load tool to the steering wheel module coil:

- J 38715-5 SIR Load Tool Adapter (pigtail connector)
- J 38715-30 Steering Column SIR Load Tool Adapter (integral connector)

Another small connector is used to substitute the load of the inflatable restraint steering wheel module and the inflatable restraint steering wheel module coil. It is connected at the base of the column to the SIR wiring harness. The third small connector is used to substitute for the load of the inflatable restraint IP module. It is connected to the inflatable restraint IP module harness connector.

You substitute the resistance of the inflator module to determine whether an inflator circuit component is causing a system malfunction. Use the load tool only when specifically called for in the diagnostic procedures.

J 38715-96 SIR Shorting Bar Tool

Use J 38715-96 SIR Shorting Bar Tool only when the SIR diagnostics call for it. The shorting bar tool lifts one side of the shorting bar on the inflatable restraint Sensing and Diagnostic Module (SDM) harness connector. The Connector Position Assurance (CPA) lifts the opposite side of the shorting bar. When the CPA and the shorting bar tool are installed the warning lamp circuit is disconnected from the ground circuit turning the warning lamp OFF.

J 38826 SIR Deployment Harness

Use J 38826 SIR Deployment Harness in order to deploy a driver inflator module outside of the vehicle. Use one of the following adapters to connect the deployment harness to the inflator module:

- J 38826-20 SIR Deployment Harness Adapter (pigtail connector)
- J 38826-50 SIR Deployment Harness Adapter (integral connector)

J 39200 Digital Multimeter

The J 39200 Digital Multimeter (DMM) is the preferred DMM for use in SIR diagnosis and repair. However, J 34029-A may be used if J 39200 is not available. No other DMMs are approved for SIR diagnosis and repair.

Scan Tool

The scan tool is used for the following reasons:

- To read and clear SIR system Diagnostic Trouble Codes (DTCs).
- To provide SIR system circuit values using the data list function.

Refer to the scan tool operator's manual for specific information on how to use it.

Special Tools and Equipment

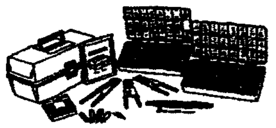
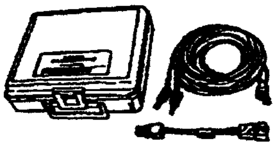
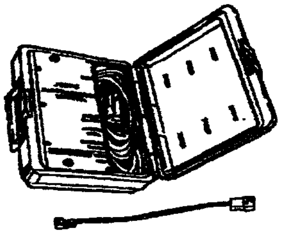
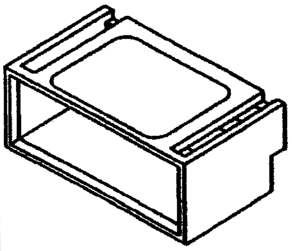
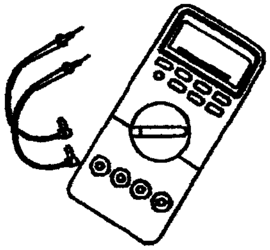
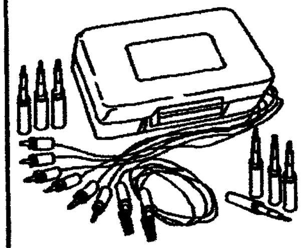
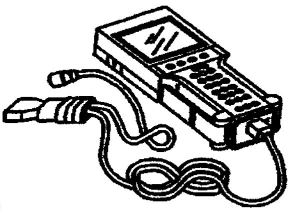
Illustration	Tool Number/ Description
 9081	J 38125-A Terminal Repair Kit
 9082	J 38826 SIR Deployment Harness
 9083	J 38715-A SIR Driver/Passenger Load Tool
 39845	J 38715-96 SIR Shorting Bar Tool

Illustration	Tool Number/ Description
 3430	J 39200 Digital Multimeter
 8917	J 35616-A Connector Test Adapter Kit
 39438	Scan Tool

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BLANK

SECTION 10A1

DOORS

GENERAL DESCRIPTION

DOORS AND HINGES

Doors use hinges that are welded to the door and body. No adjustment of this type of hinge is recommended. Replacement hinges bolt to the door and body pillars and are adjustable.

ON-VEHICLE SERVICE

DOOR HARDWARE LUBRICATION

The mechanical components of the door are lubricated during assembly. If additional lubrication is required to any door hardware mechanism, use Lubriplate Spray-Lube "A", Lubriplate Auto-Lube "A," or equivalent. Lubricate door hinge pins and rollers at normal service intervals with 30-weight engine oil. Do not lubricate the surface of the hinge roller that makes contact with the hold-open link. This may prevent the roller from rolling properly.

FRONT DOORS

WINDOW REGULATOR HANDLE REPLACEMENT

Tools Required:
J 9886-01 Door Handle Clip Remover

↔ **Remove or Disconnect (Figures 1 and 2)**

1. Raise the window to the closed position.
2. Window regulator handle from the door.
   A. Insert tool J 9886-01 between the handle and the bearing plate.
   B. Align the tool with the handle and push to disengage the clip.
   C. Pull the handle from the door.
3. Bearing plate from the door.

→← **Install or Connect (Figure 1)**

1. Bearing plate to the door.
2. Window regulator handle to the door.
   A. Install the retaining clip to the handle.
   B. Insert the handle onto the window regulator shaft so that the handle is pointing toward the front of the door.
   C. Push on the handle until the clip engages on the shaft.

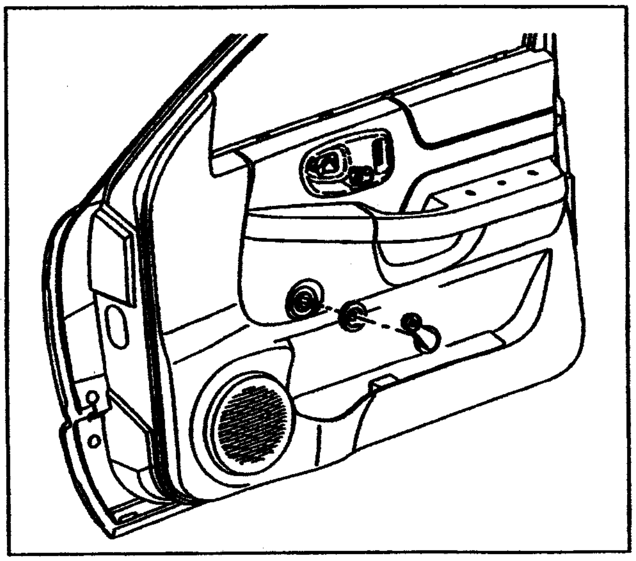


Figure 1—Window Regulator Handle

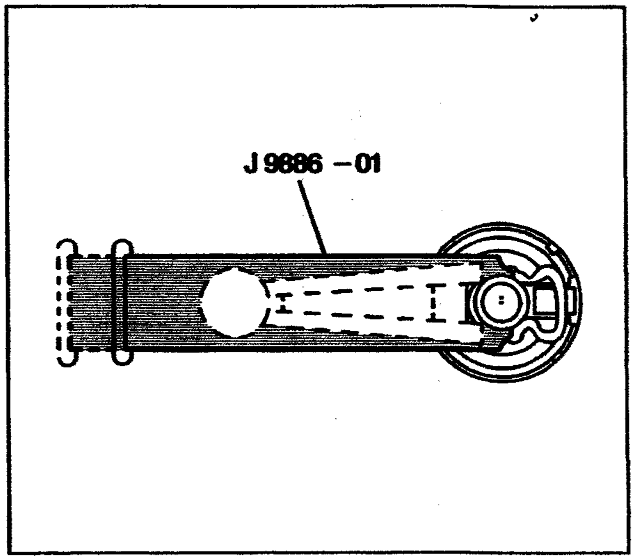


Figure 2—Window Regulator Handle Retaining Clip Removal

INSIDE DOOR HANDLE BEZEL REPLACEMENT

Remove or Disconnect (Figure 3)

1. Screw that retains the inside door handle bezel to the door trim panel.
2. Inside door handle bezel from the door trim panel by prying at rear of the bezel with the door lock knob in the locked position.

Install or Connect (Figure 3)

1. Inside door handle bezel to the door trim panel.
   A. Route the inside door handle and lock rod through the appropriate openings in the bezel.
   B. Align the lock rod to the door lock knob.
   C. Position the bezel and snap it into place.
2. Screw that retains the inside door handle bezel to the door trim panel.

Tighten

- Screw to 1.9 N·m (17 lb in).

DOOR TRIM PANEL REPLACEMENT

Tools Required:
J 38778 Door Trim Pad and Garnish Clip Remover

Remove or Disconnect (Figure 4)

1. Inside door handle bezel. Refer to Inside Door Handle Bezel Replacement in this section.
2. Window regulator handle. Refer to Window Regulator Handle Replacement in this section.
3. Trim panel armrest screw cover from the armrest.
   - Carefully pry off the cover with a flat-bladed tool.
4. Screws that retain the door trim panel to the door.
5. Door trim panel from the door.
   - Use tool J 38778 to release the door trim panel retainers.

Install or Connect (Figure 4)

1. Door trim panel to the door.
2. Screws that retain the door trim panel to the door.

Tighten

- Screws to 1.9 N·m (17 lb in).

3. Trim panel armrest screw cover to the armrest.
   - Position the cover and snap it into place.
4. Window regulator handle. Refer to Window Regulator Handle Replacement in this section.
5. Inside door handle bezel. Refer to Inside Door Handle Bezel Replacement in this section.

WATER DEFLECTOR REPLACEMENT

Waterproof deflectors are used to seal the door inner panel and prevent water from entering into the body. The deflector is secured by a strip of adhesive between the water deflector and the door.

Remove or Disconnect (Figure 5)

1. Door trim panel. Refer to Door Trim Panel Replacement in this section.
2. Water deflector(s) from the door.
   - Break the bond between the sealer and the door with a flat-bladed tool.

Install or Connect (Figure 5)

1. Water deflector(s) to the door.
   - Use strip caulking as a sealant between the deflector and the door if necessary.
2. Door trim panel. Refer to Door Trim Panel Replacement in this section.

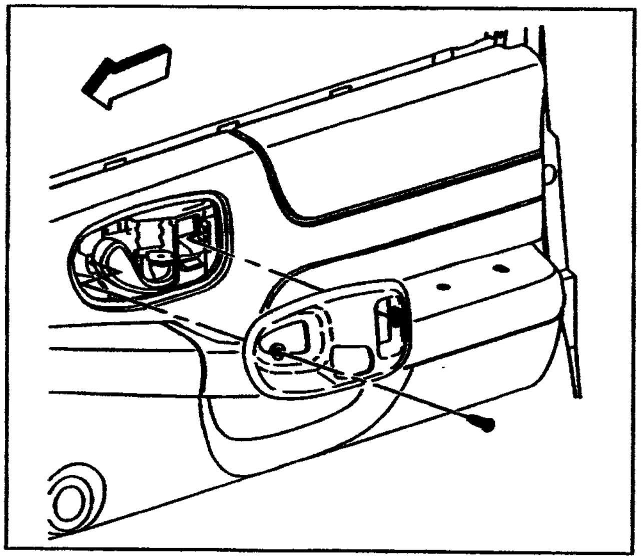


Figure 3—Inside Door Handle Bezel

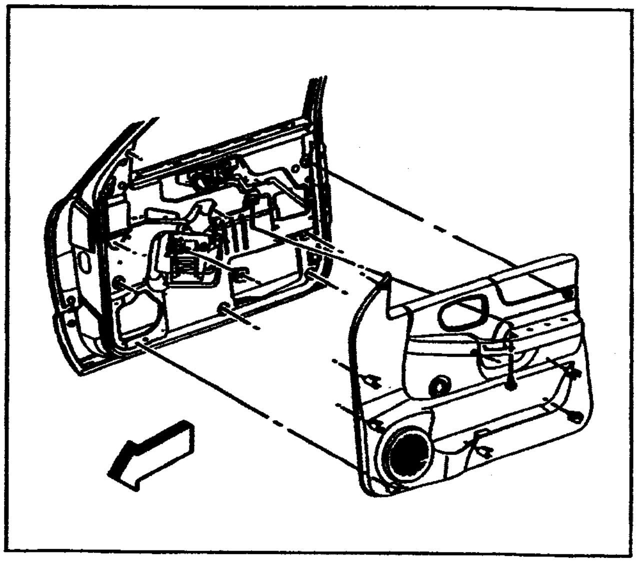


Figure 4—Front Door Trim Panel

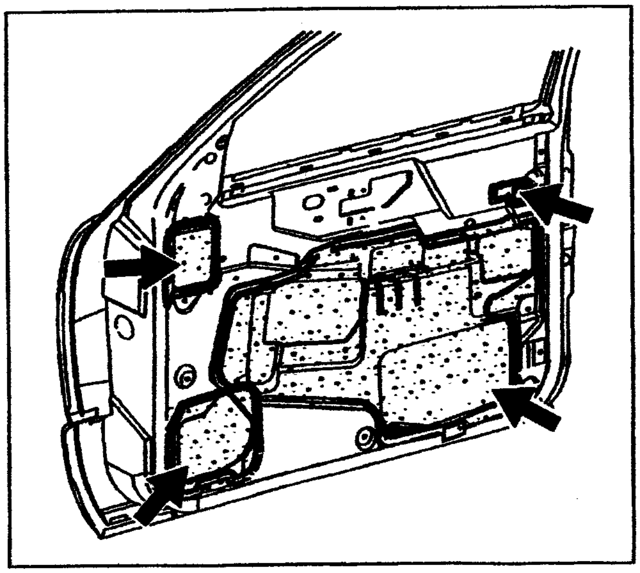


Figure 5—Door Water Deflectors

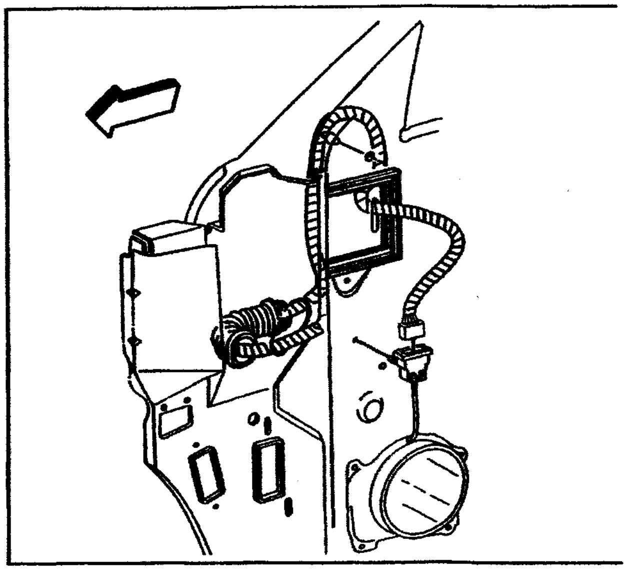


Figure 6—Front Door Speaker Harness

WIRING HARNESS REPLACEMENT

Remove or Disconnect (Figure 6)

1. Negative battery cable. Refer to Auxiliary Storage Battery.
2. Door trim panel. Refer to Door Trim Panel Replacement in this section.
3. Water deflector. Refer to Water Deflector Replacement in this section.
4. Electrical connectors, as necessary.
   A. Power mirror connector.
   B. Speaker connector.
5. Wiring harness retainers.
6. Door wiring harness from the vehicle.

Install or Connect (Figure 6)

1. Door wiring harness to the vehicle.
2. Wiring harness retainers.
3. Electrical connections as necessary.
   A. Speaker connector.
   B. Power mirror connector.
4. Water deflector. Refer to Water Deflector Replacement in this section.
5. Door trim panel. Refer to Door Trim Panel Replacement in this section.
6. Negative battery cable. Refer to Auxiliary Storage Battery.

DOOR HINGE ROLLER PIN REPLACEMENT

Tools Required:
J 36604 Door Hinge Spring Compressor

Remove or Disconnect (Figure 7)

CAUTION: Before removing the spring, cover the spring with a towel to prevent the spring from "flying" and possibly causing damage or personal injury.

1. Door hinge spring, using J 36604.
2. C-clip that retains the door hinge roller pin
3. Door hinge roller pin from the vehicle.

Install or Connect (Figure 7)

1. Door hinge roller pin to the vehicle.
2. C-clip that retains the door hinge roller pin.
3. Door hinge spring, using J 36604.

DOOR REPLACEMENT

Tools Required:
J 36604 Door Hinge Spring Compressor

Remove or Disconnect (Figures 8 and 9)

1. Door trim panel. Refer to Door Trim Panel Replacement in this section.
2. Electrical connectors as necessary.
3. Rubber conduit from the door and body hinge pillar

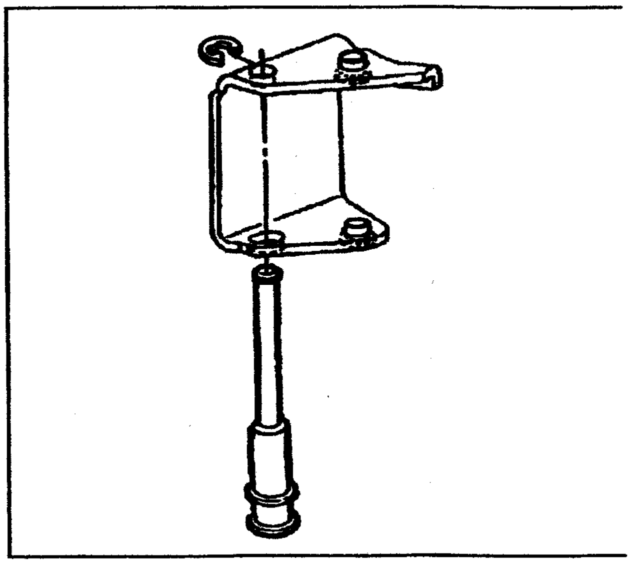


Figure 7—Door Hinge Roller Pin

4. Apply cloth backed tape to the door and body hinge pillar to protect them from scratches.

CAUTION: Before removing the spring, cover the spring with a towel to prevent the spring from "flying" and possibly causing damage or personal injury.

5. Door hinge spring, using J 36604.
6. Hinge pin retainers from the hinge pins and discard.
7. Lower hinge pin using a soft-faced hammer and locking pliers.
   - Install a bolt temporarily through the lower hinge to hold the door in place while removing the upper hinge pin
8. Upper hinge pin
9. Temporary bolt from the lower hinge.
10. Door from the vehicle.

Install or Connect (Figures 8 and 9)

1. Door to the vehicle.
   - Install a bolt temporarily through the lower hinge to hold the door in place while installing the upper hinge pin
2. Upper hinge pin, with the pointed end of the pin pointing up.
3. Remove the temporary bolt from the lower hinge.
4. Lower hinge pin, with the pointed end of the pin pointing down.
5. New hinge pin retainers to the hinge pins.
6. Door hinge spring, using J 36604.
7. Remove the tape from the door and body hinge pillar.
8. Rubber conduit to the door and body hinge pillar.
9. Electrical connectors, as necessary.
10. Door trim panel. Refer to Door Trim Panel Replacement in this section.

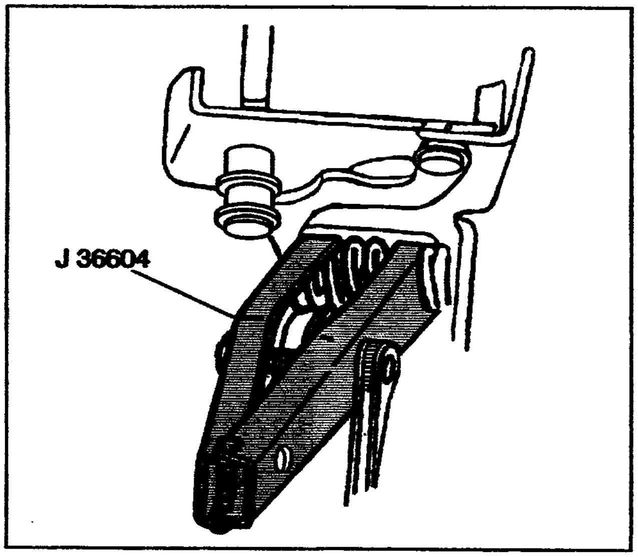


Figure 8—Door Hinge Spring Compressor

DOOR HINGE REPLACEMENT

Remove or Disconnect (Figure 10)

1. Door. Refer to Door Replacement in this section.
2. Water deflector. Refer to Water Deflector Replacement in this section.
3. Speaker, if equipped. Refer to Audio Systems.
4. Excess body sealer surrounding hinges.
5. Door hinges from the door and body hinge pillar.
   A. Scribe the location of the existing hinges on the door and body hinge pillar.
   B. Use a center punch to mark the center of each of the weld marks on the original hinges.
   C. Using the marks made by the center punch, drill 3 mm (0.12 in) pilot holes through the welds, drilling deep enough to penetrate the hinge base only.
   D. Using the pilot holes, drill 13 mm (0.50 in) holes through the welds, drilling deep enough to penetrate the hinge base only.
   E. Drive a chisel between the hinge base and door or body hinge pillar to separate the hinge from the door or body hinge pillar.
6. Instrument panel (upper door body-side hinge only). Refer to Interior Trim.
7. Fender bolt (upper door body-side hinge only). Refer to Sheet Metal and Fiberglass.
8. Body hinge pillar trim panel (lower door body-side hinge only). Refer to Interior Trim.
9. Parking brake lever (lower left body-side hinge only). Refer to Parking Brake.
10. Door opening weatherstrip. Refer to "Door Opening Weatherstrip Replacement" in this section.

Install or Connect (Figures 11 and 12)

1. Prepare the surfaces for the replacement hinges using a file or equivalent.
   A. Ensure that the hinge seating areas are flat.
   B. Remove any burrs from the holes on the inside of the door or body hinge pillar to ensure good seating for the anchor plate.

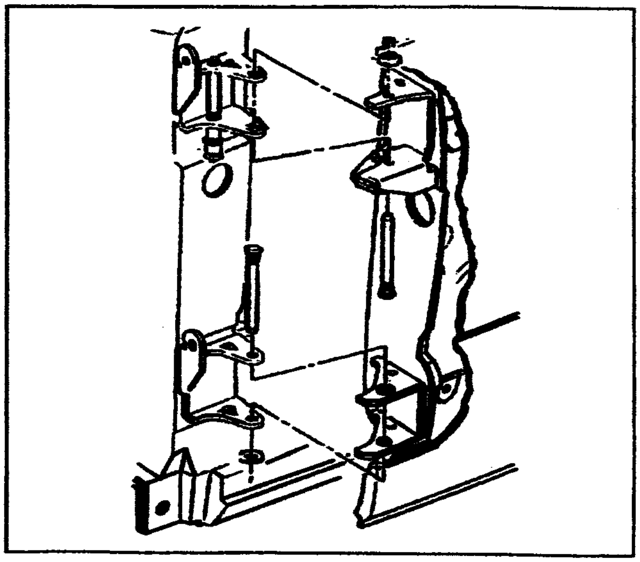


Figure 9—Door Hinge Pins

   C. Paint the hinge surfaces on the door panel or body hinge pillar at the hinge mounting area.
   D. Coat the surface of the hinge that mates to door panel or body hinge pillar with a medium-bodied sealer.
2. Door hinges.
   - Position the bolt-on service replacement hinge within the scribe marks made on the door and body hinge pillar at time of removal.
3. Hinge bolts and tapped anchor plate.
   A. Align the hinge and tapped plate with the holes in the door or hinge pillar.
      - Attach welding rod to the tapped anchor plates to aid in aligning the mounting holes.
   B. Place the bolts through the door or hinge pillar and into the tapped backing plate.

Tighten

- Hinge bolts to 35 N.m (26 lb ft).

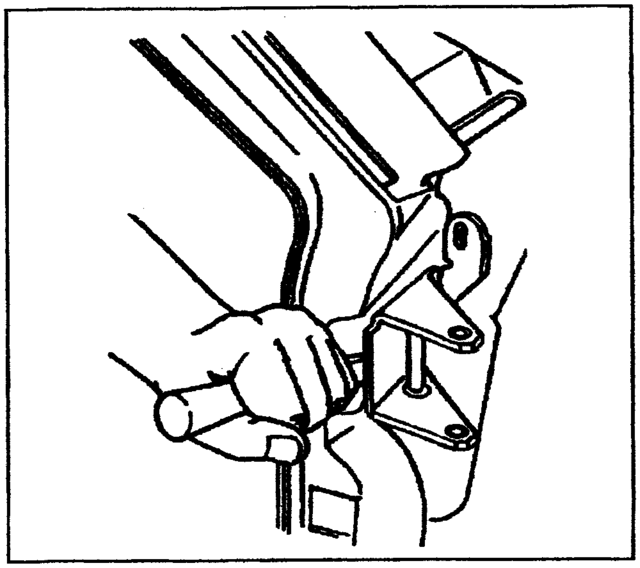


Figure 10—Chiseling Hinge From Body Pillar

4. Fender bolt (upper door body-side hinge only). Refer to Sheet Metal and Fiberglass.
5. Instrument panel (upper door body-side hinge only). Refer to Interior Trim.
6. Body hinge pillar trim panel (lower door body-side hinge only). Refer to Interior Trim.
7. Parking brake lever (lower left body-side hinge only). Refer to Parking Brake.
8. Door opening weatherstrip. Refer to "Door Opening Weatherstrip Replacement" in this section.
9. Speaker, if equipped. Refer to Audio Systems.
10. Water deflector. Refer to "Water Deflector Replacement" in this section.
11. Door. Refer to "Door Replacement" in this section.

Adjust

- Door to fit the door frame opening properly. Refer to Door Adjustment (Bolt-On Hinges) in this section.

DOOR ADJUSTMENT (BOLT-ON HINGES)

This procedure can only be used when bolt-on service replacement hinges have been installed.

- Loosen the door hinge-to-body side pillar or door hinge-to-door bolts as necessary.

Adjust (Figure 13)

- Door up, down, forward, rearward, in, or out at the door hinges.
  1. Gap between the bottom of the door and the rocker panel to 6 mm ± 1 mm (0.24 in ± 0.03 in).
  2. Gap between the top of the door and the roof panel to 6 mm ± 1 mm (0.24 in ± 0.03 in).
  3. Gap between the rear edge of the door and the body pillar or rear door to 5 mm ± 1 mm (0.19 in ± 0.03 in).

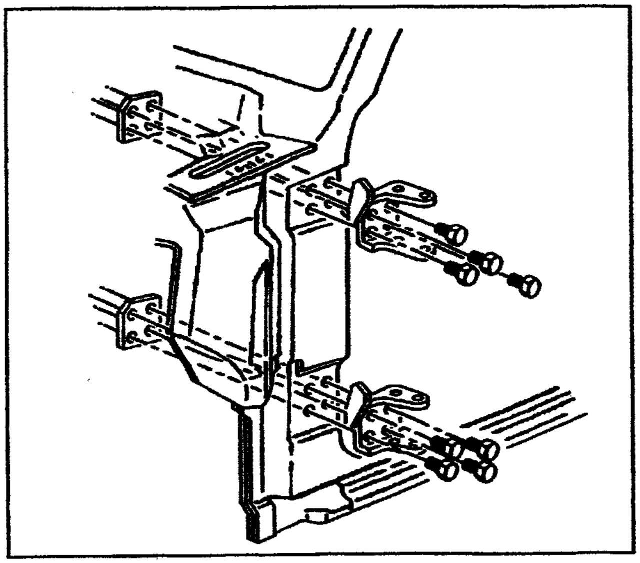


Figure 11—Replacement Hinges (Body Side)

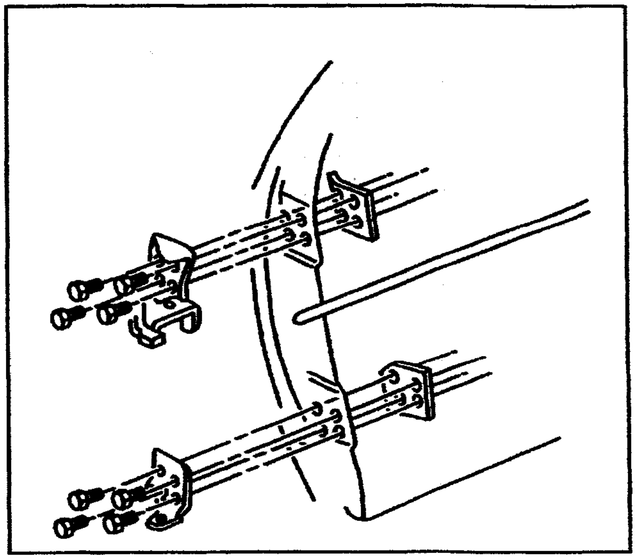


Figure 12—Replacement Hinges (Door Side)

4. Gap between the forward edge of the door and the front fender to 5 mm ± 1 mm (0.19 in ± 0.03 in).
5. Door surfaces flush with other panels within ± 1 mm(0.03 in).

Tighten

- Hinge bolts to 35 N.m (26 lb ft).

6. Adjust door striker, if necessary, to properly engage the door latch.

A. Loosen door striker bolts.
B. Adjust door striker.

Tighten

- Door striker bolts to 22 N.m (16 lb ft).

DOOR STRIKER REPLACEMENT

Important

- If both door striker bolts are removed at the same time, the striker backing plate will fall into the body, resulting in additional time to perform the repair.

Remove or Disconnect (Figure 14)

1. Lower striker bolt.
2. Loosen the upper striker bolt enough to rotate the striker and spacer (if equipped) away from the lower bolt hole.
3. Install the lower striker bolt and tighten it sufficiently to hold the striker backing plate in place.
4. Upper striker bolt, spacer (if equipped), and striker.

Install or Connect (Figure 14)

1. Striker, spacer (if equipped), and upper striker bolt. If the striker backing plate has moved, rotate the lower striker bolt until the upper threaded hole is properly aligned.
2. Remove the lower bolt.
3. Rotate the striker and spacer (if equipped) to align the lower threaded hole in the striker backing plate.
4. Lower striker bolt.
5. Adjust door striker, if necessary, to properly engage the door latch.
   A. Loosen door striker bolts.
   B. Adjust door striker.

Tighten

- Door striker bolts to 22 N.m (16 lb ft).

INSIDE DOOR HANDLE REPLACEMENT

Remove or Disconnect (Figure 15)

1. Door trim panel. Refer to Door Trim Panel Replacement in this section.
2. Water deflector. Refer to Water Deflector Replacement in this section.
3. Inside door handle rod.
4. Drill out the rivets that secure the inside door handle to the door.
5. Inside door handle from the door.

Install or Connect (Figure 15)

1. Inside door handle to the door.
2. Rivets that secure the inside door handle to the door.
3. Inside door handle rod.
4. Water deflector. Refer to Water Deflector Replacement in this section.
5. Door trim panel. Refer to Door Trim Panel Replacement in this section.

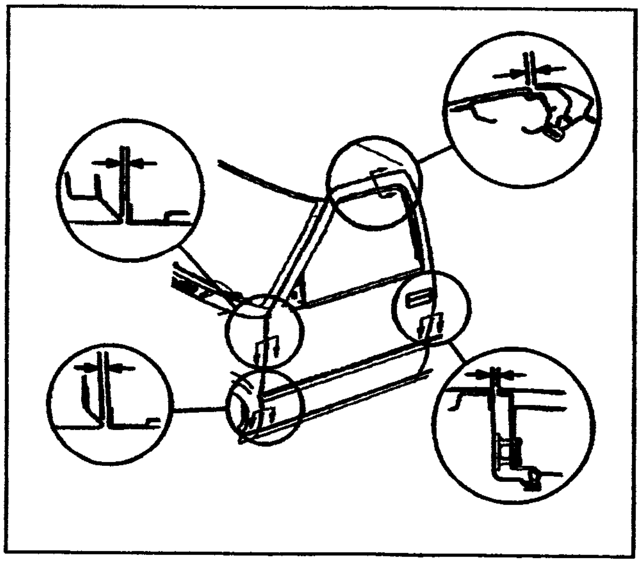


Figure 13—Door Adjustments

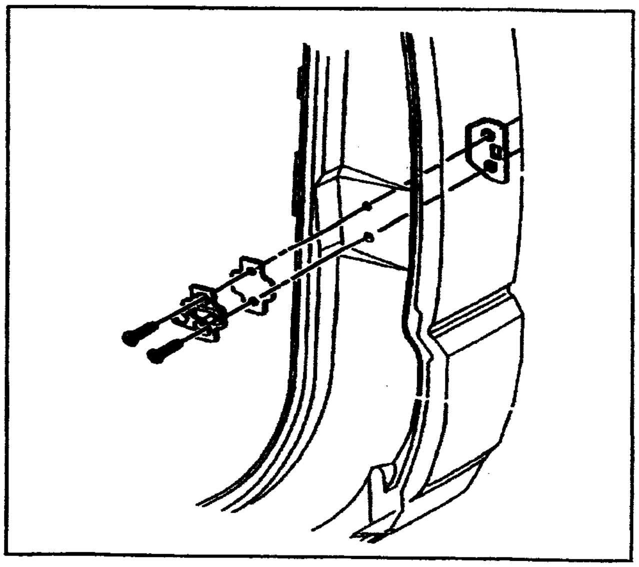


Figure 14—Door Striker

OUTSIDE DOOR HANDLE REPLACEMENT

↔ Remove or Disconnect (Figures 16 and 17)

1. Raise the window to the closed position.
2. Door trim panel. Refer to Door Trim Panel Replacement in this section.
3. Water deflector. Refer to Water Deflector Replacement in this section.
4. Outside door handle screw access hole plug.
5. Outside door lock rod from the handle.
6. Outside door handle rod from the handle.
7. Screws that retain the outside door handle to the door panel.
8. Outside door handle from the door.

→← Install or Connect (Figures 16 and 17)

1. Outside door handle to the door.
2. Screws that retain the outside door handle to the door panel.

   Tighten

   - Screws to 4 N·m (35 lb in).
3. Outside door lock rod to the handle.
4. Outside door handle rod to the handle.
5. Outside door handle screw access hole plug.
6. Water deflector. Refer to Water Deflector Replacement in this section.
7. Door trim panel. Refer to Door Trim Panel Replacement in this section.

BINDING LOCK CYLINDERS

Binding or sticking door lock cylinders and keys that are hard to insert or remove may be corrected in many cases by applying the proper lubrication.

The recommended materials for lubricating these components are (in order of preference):

- Lubricant GM P/N 12345120, or equivalent.
- 5 W-30 synthetic motor oil.
- Silicone spray GM P/N 1052276, or equivalent.

Penetrating lubricants such as GM P/N 1052949 an WD-40® ARE NOT RECOMMENDED because the wash out the original lubrication and eventually evaporate, leaving little or no lubricating material. However, i these materials are used to unfreeze or loosen loc cylinder components. Refer to Steps 2 through 4 below for proper methods of lubrication.

Frozen lock cylinders due to cold weather may b repaired using the following procedure:

1. Apply heat to the lock cylinder with a heat gu while being careful not to damage the painte surfaces.

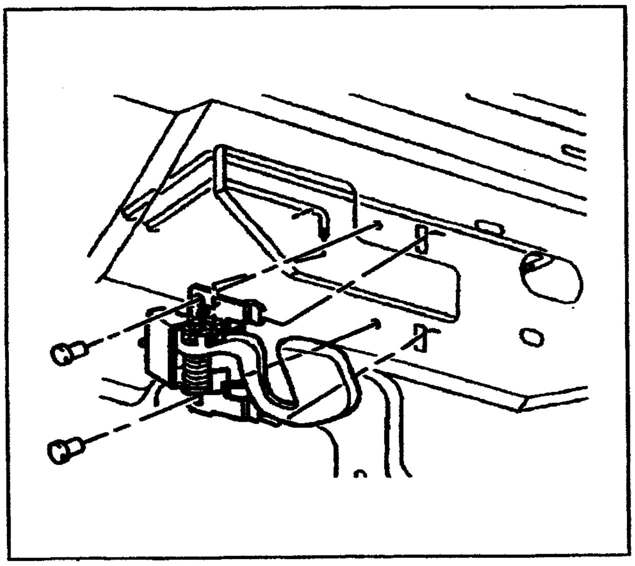
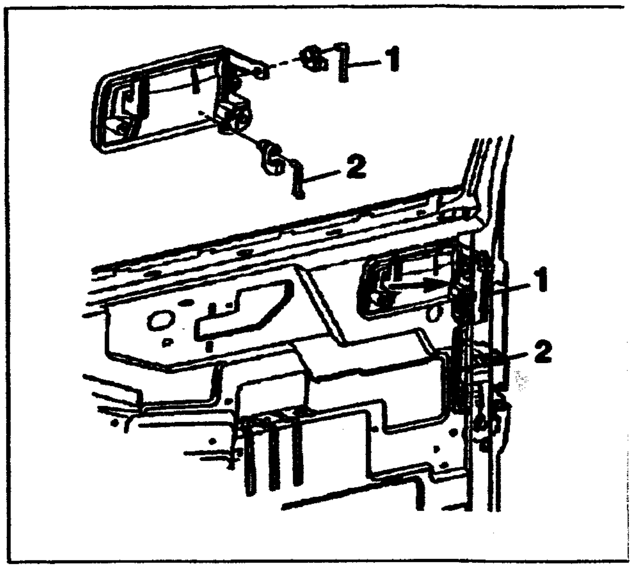


Figure 15—Door Inside Handle



Legend

(1) Outside Door Handle Rod
(2) Outside Door Lock Rod

Figure 16—Door Lock Cylinder and Outside Door Handle Lock Rods

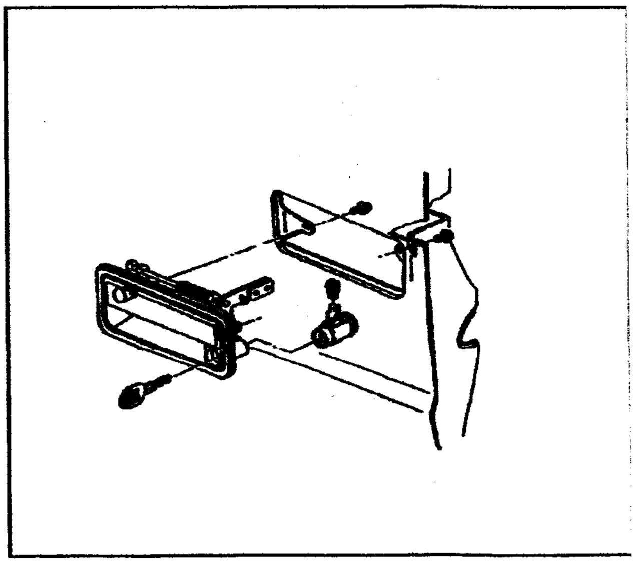


Figure 17—Door Lock Cylinder and Outside Handle

2. Hold the lock cylinder shutter open with a paper clip (or similar object) and force air into the cylinder using compressed air and a blow gun attachment.
3. While holding the lock cylinder shutter open, inject a small amount of lubricant (refer to above recommendations) into the cylinder.
4. Work the key into the lock cylinder several times and wipe any excess lubricant from the key.

LOCK CYLINDER REPLACEMENT

New lock cylinders are available as replacement parts. If lock cylinders require replacement for any reason, apply a coating of lubricant GM P/N 12345120, or equivalent, inside of the lock case and cylinder keyway prior to assembling and installing the cylinder.

To repair a binding lock cylinder, refer to Binding Lock Cylinders in this section. To code a new lock cylinder, refer to General Information.

Remove or Disconnect (Figures 16 and 17)

1. Outside door handle. Refer to Outside Door Handle Replacement in this section.
2. Door lock cylinder from the outside door handle.

Install or Connect (Figures 16 and 17)

1. Door lock cylinder to the outside door handle.
2. Outside door handle. Refer to Outside Door Handle Replacement in this section.

OUTSIDE REARVIEW MIRROR REPLACEMENT

Remove or Disconnect (Figures 18 and 19)

1. Door trim panel. Refer to Door Trim Panel Replacement in this section.
2. Access hole plugs.
3. Nuts that retain the outside rearview mirror to the door.
4. Outside rearview mirror from the door.

Install or Connect (Figures 18 and 19)

1. Outside rearview mirror to the door.
2. Nuts that retain the outside rearview mirror to the door.

Tighten

- Nuts to 6 N·m (53 lb in).

3. Access hole plugs.
4. Door trim panel. Refer to Door Trim Panel Replacement in this section.

OUTSIDE REARVIEW MIRROR LENS REPLACEMENT

Remove or Disconnect

1. Place tape over the mirror lens.
2. Cover the mirror lens with a cloth.
3. Break the mirror lens.

CAUTION: To prevent personal injury, gloves should be worn when removing broken glass.

4. Broken mirror lens and fiber pad.

Clean

- Glass from inside the mirror frame.

Install or Connect

1. Remove the adhesive backing from the back of the replacement mirror lens.
2. Replacement mirror lens to the mirror assembly, pressing firmly to apply.

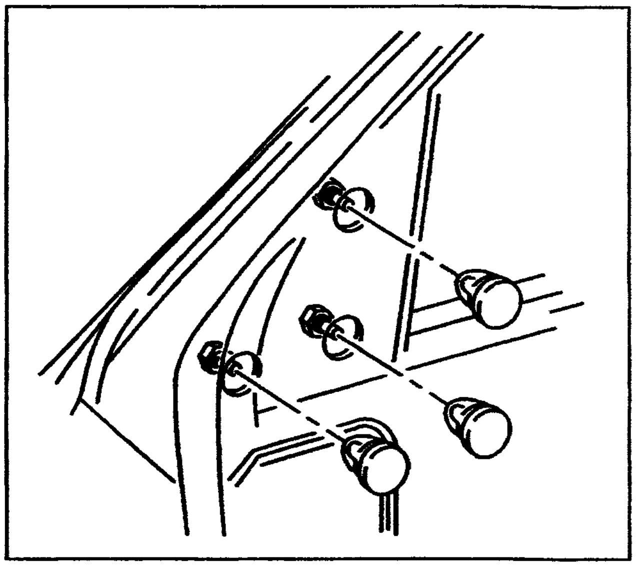


Figure 18—Outside Rearview Mirror Nuts and Access Hole Plugs

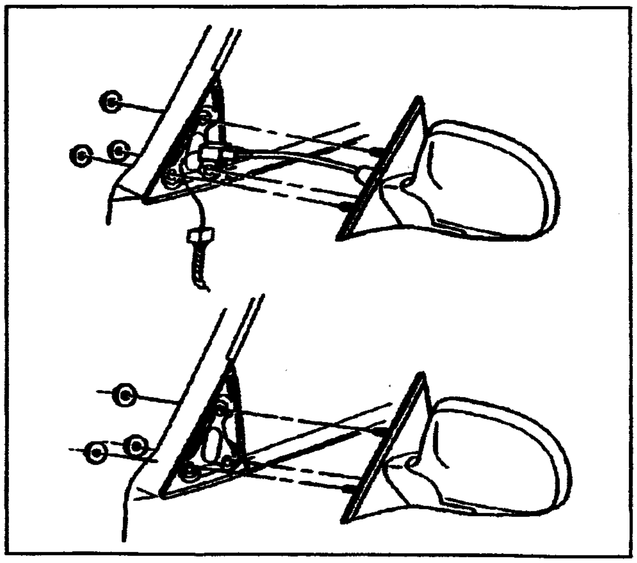


Figure 19—Outside Rearview Mirror

WINDOW RUN CHANNEL REPLACEMENT

Remove or Disconnect (Figure 20)

1. Door trim panel. Refer to Door Trim Panel Replacement in this section.
2. Water deflector. Refer to Water Deflector Replacement in this section.
3. Bolts that retain the front run channel to the door.
4. Front run channel from the door.
   - Carefully pull the front run channel to disengage it from the window weatherstrip.
5. Slide the window forward.
6. Bolts that retain the rear run channel to the door.
7. Rear run channel from the door.
   - Carefully pull the rear run channel to disengage it from the window weatherstrip.

Install or Connect (Figure 20)

1. Rear run channel to the door.
2. Bolts that retain the rear run channel to the door.

Tighten

- Bolts to 10 N.m (88 lb in).

3. Slide the window rearward into the rear run channel.
4. Front run channel to the door.
5. Bolts that retain the front run channel to the door.

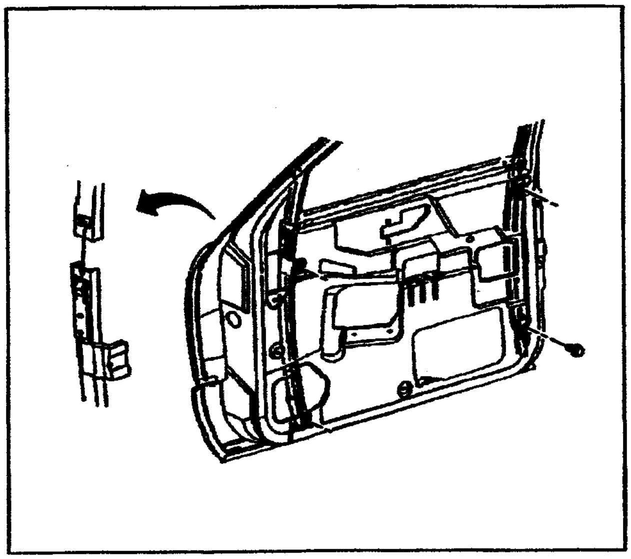


Figure 20—Door Window Run Channels

Tighten

- Bolts to 10 N.m (88 lb in).

6. Water deflector. Refer to Water Deflector Replacement in this section.
7. Door trim panel. Refer to Door Trim Panel Replacement in this section.

WINDOW REPLACEMENT

CAUTION: To prevent personal injury, gloves should be worn when removing broken glass.

Remove or Disconnect

1. Lower the window about one-half the way down. In this position, the window regulator rollers should be accessible through the openings in the door panel.
2. Window run channels. Refer to Window Run Channel Replacement in this section.
3. Window weatherstrip. Refer to Window Weatherstrip Replacement in this section.
4. Door outer weatherstrip. Refer to Outer Door Weatherstrip Replacement in this section.
5. Window from the regulator.
   A. Move the window forward to release the sash channel from the rear regulator roller.
   B. Carefully tilt the window forward to a vertical position and pull it upward to release the sash channel from the front regulator roller.
6. Window from the door.

Install or Connect

1. Window to the door.
2. Window to the regulator.
   A. Carefully rotate glass vertically and slide the sash channel downward into the front regulator roller.
   B. Move the window forward and align the rear of the sash channel with the rear regulator roller.
   C. Slide the sash channel into the rear regulator roller.
3. Door outer weatherstrip. Refer to Outer Door Weatherstrip Replacement in this section
4. Window weatherstrip. Refer to Window Weatherstrip Replacement in this section.
5. Door window run channels. Refer to Door Window Run Channel Replacement in this section.

WINDOW REGULATOR REPLACEMENT

Remove or Disconnect (Figure 21)

1. Window. Refer to Window Replacement in this section.
2. Drill out the rivets that secure the window regulator to the door.
3. Window regulator from the door.

Install or Connect (Figure 21)

1. Window regulator to the door.
2. Rivets that secure the window regulator to the door.
3. Window. Refer to Window Replacement in this section.

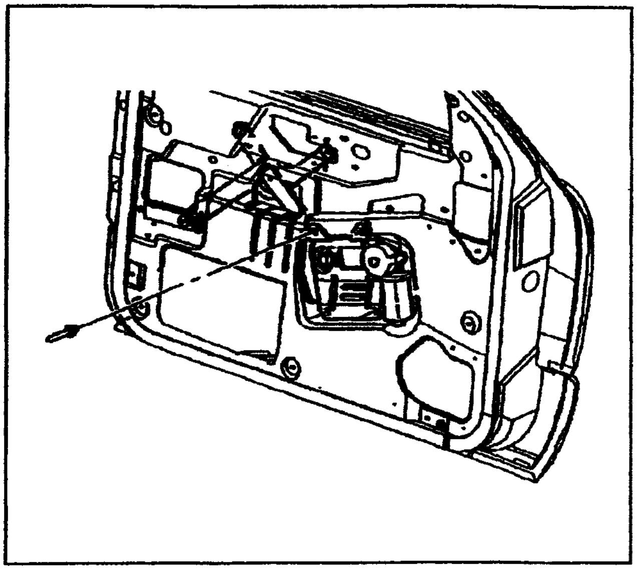


Figure 21—Front Door Regulator and Motor Assembly

WEATHERSTRIP REPLACEMENT

OUTER DOOR WEATHERSTRIP REPLACEMENT

The outer door weatherstrip is used to seal the inner and outer door panels and the window at the belt line. The outer door weatherstrip can be replaced. Do not remove the inner sealing strip since the strip is stapled to the trim panel.

Remove or Disconnect (Figure 22)

1. Open the window.
2. Outer door weather strip from the door.

Install or Connect (Figure 22)

1. Outer door weather strip to the door.
   - Position the weatherstrip and press it into place.
2. Close the window.

DOOR OPENING WEATHERSTRIP REPLACEMENT

Remove or Disconnect (Figure 23)

1. Door opening weatherstrip from the door opening.
   - Pull the weatherstrip from the pinch-weld flange.

Install or Connect (Figure 23)

1. Door opening weatherstrip to the door opening.
   - A. Position the pre-formed corner of the weatherstrip in the upper rear corner of the door opening.
   - B. Push the weatherstrip onto the pinch weld flange, starting at the pre-formed corner, and work around the entire edge of the door opening.

DOOR ROCKER WEATHERSTRIP REPLACEMENT

Tools Required:
J 38778 Door Trim Pad and Garnish Clip Remover

Remove or Disconnect (Figure 24)

1. Door rocker weatherstrip from the door, using J 38778.

Install or Connect (Figure 24)

1. Door rocker weatherstrip to the door.
   - Position the weatherstrip and press it into place.

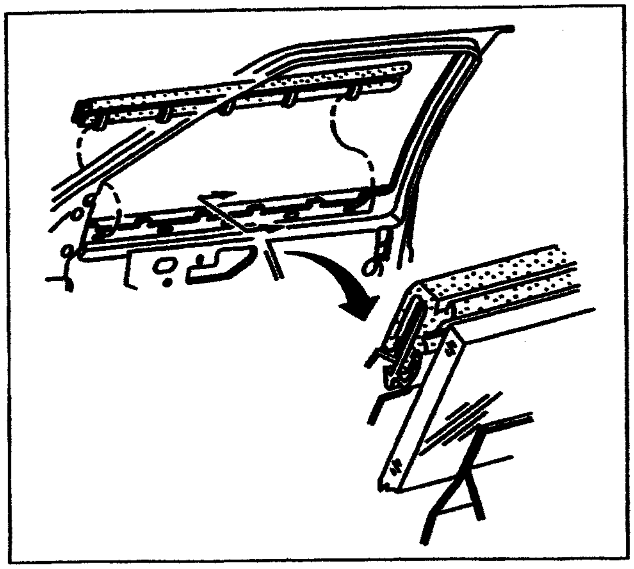


Figure 22—Outer Door Weatherstrip

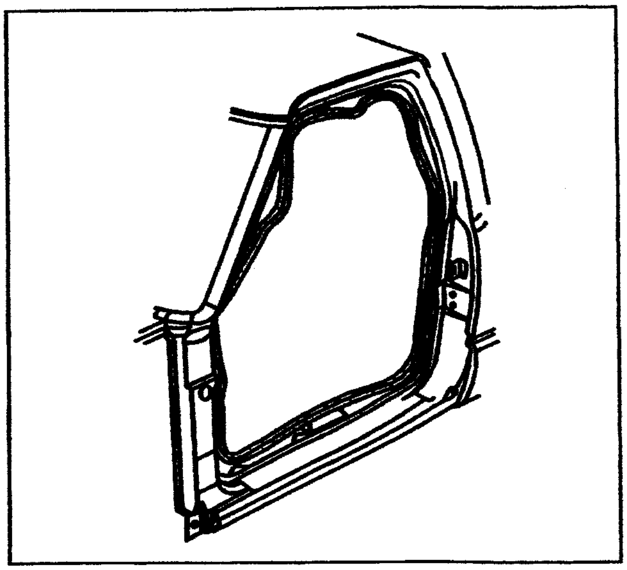


Figure 23—Door Opening Weatherstrip

ROOF DRIP WEATHERSTRIP REPLACEMENT

↔ Remove or Disconnect (Figure 25)

1. Pull the roof drip weatherstrip from the door opening frame.
2. Remove any remaining weatherstrip material or adhesive.

→← Install or Connect (Figure 25)

1. Roof drip weatherstrip to the door opening frame.
   - Remove the adhesive backing from the weatherstrip and apply the weatherstrip to the door opening frame.

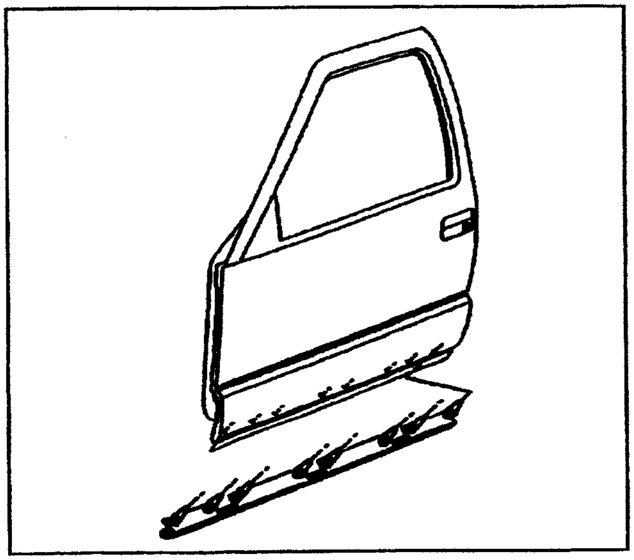


Figure 24—Typical Door Rocker Weatherstrip

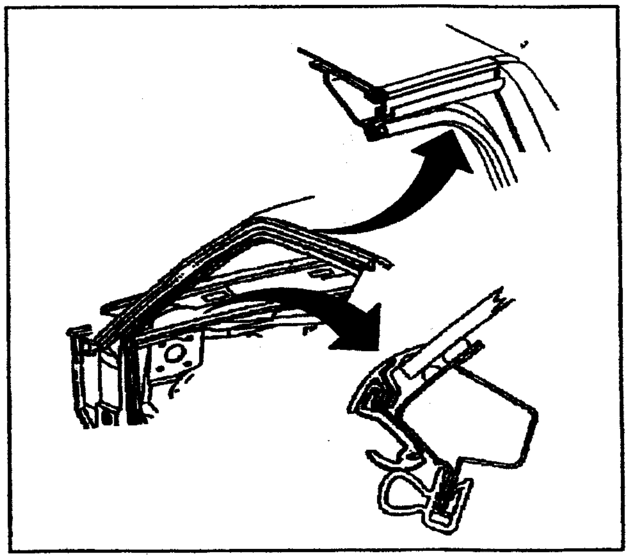


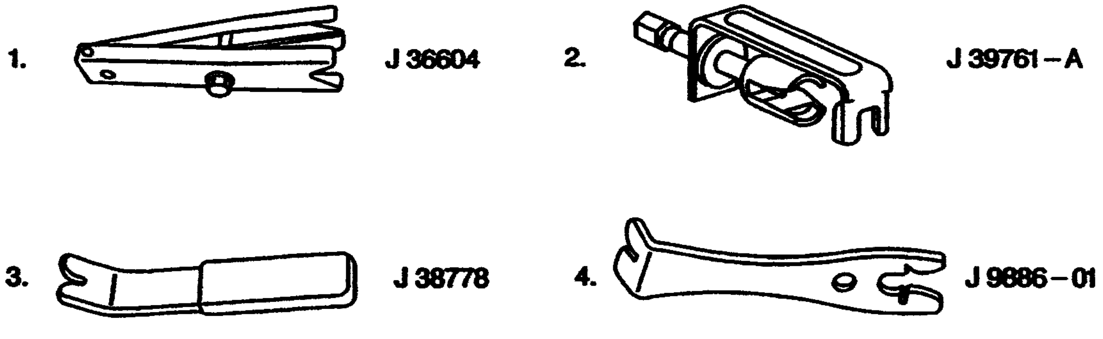
Figure 25—Roof Drip Weatherstrip

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N.m	Lb Ft	Lb In
Inside Door Handle Bezel Screw	1.9	—	17
Door Trim Panel Screws	1.9	—	17
Replacement Door Hinge Bolts	35	26	—
Door Striker Bolts	22	16	—
Door Lock Assembly Screws	9	—	80
Door Outside Handle Screws	4	—	35
Rearview Mirror Nuts	6	—	53
Run Channel Bolts	10	—	88

SPECIAL TOOLS



1. DOOR HINGE SPRING COMPRESSOR
2. DOOR HINGE SPRING TOOL
3. TRIM PAD REMOVER
4. DOOR HANDLE CLIP REMOVER

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SECTION 10A2

SEATS

DIAGNOSIS OF MANUAL SEAT ADJUSTER

PROBLEM	POSSIBLE CAUSE	CORRECTION
Adjuster Will Not Lock	1. Locking wire too tight. 2. Adjuster lock bar spring disconnected or broken. 3. Adjuster lock sticking or binding.	1. Loosen locking wire tension enough to provide full engagement of lock bar in locking slots of adjuster lower channel. 2. Connect spring or install new spring. 3. Lubricate lock bar pivot. If bar is binding, eliminate cause of binding or replace adjuster.
Adjuster Will Not Unlock	1. Locking wire too loose or disconnected. 2. Adjuster lock bar sticking or binding.	1. Tighten locking wire enough to allow lock bar to disengage from locking slots in adjuster lower channel when lock control lever is activated. 2. Lubricate lock bar pivot. If bar is binding eliminate cause of binding or replace adjuster.
When Left Adjuster Locks, Right Adjuster Is Between Lock Positions	1. Adjusters new, not seated. 2. Adjuster(s) improperly lubricated. 3. Adjusters binding due to bent or damaged channels. 4. Adjusters not in parallel alignment with each other.	1. Operate seat to full forward and full rearward positions several times to work tightness out of new channels. 2. Lubricate adjuster channels with Lubriplate Auto-Lube A or equivalent. 3. Replace adjuster. 4. Loosen floor pan attaching bolts or nuts, align adjusters parallel on floor pan, and retighten bolts or nuts.

D0115

ON-VEHICLE SERVICE

SEAT BACK COVER REPLACEMENT

↔ **Remove or Disconnect (Figures 1 and 2)**

1. Seat from vehicle. Refer to Seat Replacement in this section.
2. Headrest from seat back. Refer to Headrest Removal in this section.
3. Separate J-strip at base of seat back.
4. Separate J-strips from sides.
5. Seat back release lever bezel, if equipped. Refer to Seat Back Release Lever Bezel Removal in this section.
6. Seat back to seat frame bolts.
7. Electrical connector, if necessary.
8. Pivot bolt to seat back and seat bottom.
9. Separate seat back pad from seat back frame.
10. Two seat back recliner bolts on outboard side of seat.
11. Plastic inserts attached to seat back cardboard.
12. Pull cover up entire seat back.
13. Heat element to seat back, if equipped.

! **Important**

- Use care when removing velcro retaining cover not to damage seat fabric.

14. Seat back cover.

→← **Install or Connect (Figures 1 and 2)**

1. Plastic inserts to seat back cardboard.
2. Two seat back recliner bolts on outboard side of seat.
3. Seat back pad to seat back frame.

4. Pull seat cover over entire seat back.

Important

- When placing seat back to seat bottom make sure pivot bolt goes in first.

5. Pivot bolt to seat back and seat bottom.
6. Electrical connector, if necessary.
7. Seat back to seat frame bolts.
8. Seat back release lever bezel, if equipped.
9. Engage J-strips to sides.
10. Engage J-strip at base of seat back.
11. Headrest to seat back.
12. Seat to vehicle.

SEAT BACK PAD REMOVAL

Remove or Disconnect (Figure 2)

1. Seat back cover. Refer to Seat Back Cover Removal in this section.
2. Plastic inserts attached to seat back cardboard.
3. Seat back pad from seat back frame.

Install or Connect (Figure 2)

1. Seat back pad to seat frame.
2. Plastic inserts to seat back cardboard.
3. Seat back cover.

SEAT TRACK ASSEMBLY REMOVAL

Remove or Disconnect

1. Remove seat from vehicle. Refer to Seat Replacement in this section.
2. Trim plate.
3. Pull back seat bottom pad.
4. Seat track to seat bottom bolts.
5. Seat back frame bolts from seat track.
6. Separate seat track from seat bottom.

Install or Connect

1. Seat track to seat bottom.
2. Seat back frame bolts to seat track.
3. Seat track to seat bottom bolts.

Tighten

- Bolts to 32 N.m (24 lb ft).

4. Pull down seat bottom pad.
5. Trim plate.
6. Seat to vehicle.

SEAT BOTTOM COVER REMOVAL

Remove or Disconnect (Figure 3)

1. Seat from vehicle. Refer to Seat Replacement in this section.
2. Trim plate.
3. Separate J-strips from seat bottom frame.

Important

- Use care when removing velcro retaining cover not to damage seat fabric.

4. Separate velcro strips retaining seat pad to cover.
5. Seat back from seat bottom bolts.
6. Seat belt holder bolt.
7. Bracket bolt for seat trim plate screws.
8. Pivot bolt from seat back and seat bottom.
9. Seat bottom from frame.
10. Seat bottom pad from seat bottom cover.
11. Seat bottom cover from seat bottom.

Install or Connect (Figure 3)

1. Seat bottom cover to seat bottom.
2. Seat bottom pad to seat bottom cover
3. Seat bottom from frame.

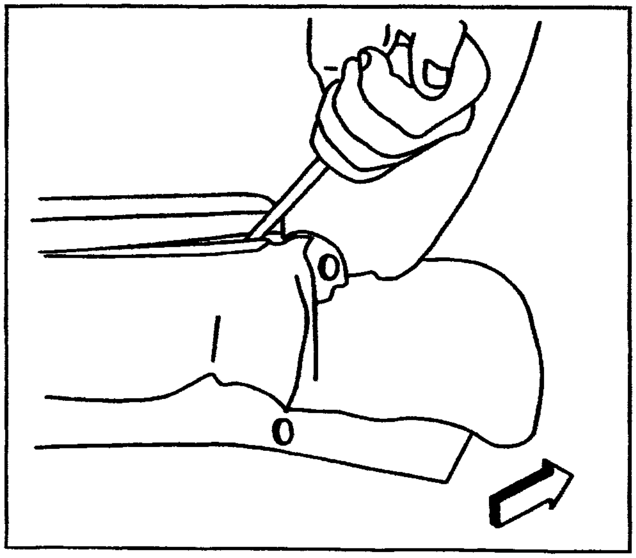


Figure 1—Separation of J-Strips

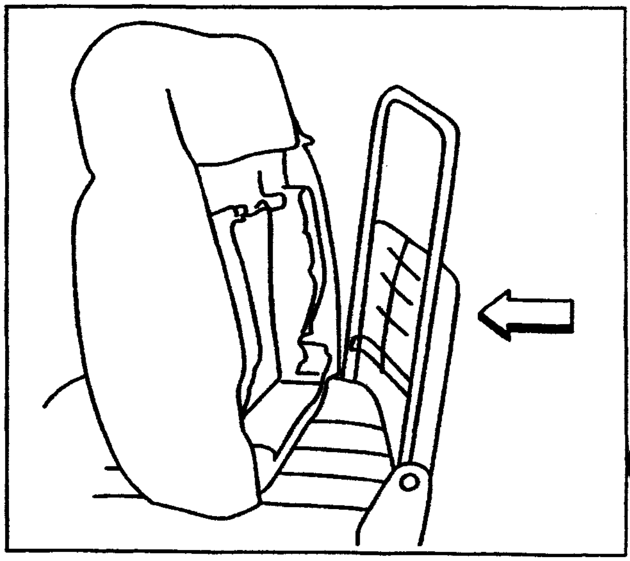


Figure 2—Removal/Installation of Seat Back Pad

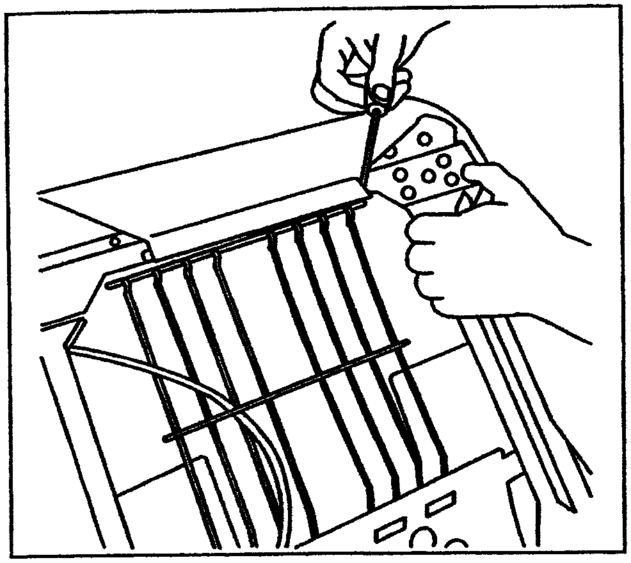


Figure 3—Seat Bottom J-Strips

4. Pivot bolt to seat back and seat bottom.

Tighten

- Bolt to 24 N.m (18 lb ft).

5. Bracket bolt for seat trim plate screws.
6. Seat belt holder bolt.
7. Seat back to seat bottom bolts.
8. Engage velcro strips retaining seat pad to cover.
9. Engage J-strips to seat bottom frame.
10. Trim plate.
11. Seat to vehicle. Refer to Seat Replacement in this section.

SEAT BOTTOM PAD REMOVAL

Remove or Disconnect

1. Trim plate.
2. Separate J-strips from seat bottom cover.
3. Separate velcro strips retaining seat pad to cover.

Important

- Use care when removing velcro retaining cover not to damage seat fabric.

4. Seat bottom pad from seat bottom frame.

Install or Connect

1. Seat bottom pad to seat bottom frame.
2. Engage velcro strips retaining seat pad to cover.
3. Engage J-strips to seat bottom cover.
4. Trim plate.

SEAT ADJUSTER TRIM COVER REPLACEMENT

Seat Adjuster Trim

Remove or Disconnect (Figure 4)

1. Screws from side covers from seat assembly.
   - Move seat forward or backwards to gain access to the screws.
2. Side covers.

Install or Connect (Figure 4)

1. Side covers.
2. Screws to side covers to seat assembly.

Tighten

- Tighten side cover screws to 1.4 N.m (13 lb in).

SEAT REPLACEMENT

Remove or Disconnect (Figure 5)

1. Seat adjuster trim covers. Refer to Seat Adjuster Trim Cover Replacement in this section.
2. Seat nuts.
3. Two bolts from seat rear mounting brackets.
4. Seat from the vehicle.
   - Guide seat belts though slots in seat.

Install or Connect (Figure 5)

1. Seat to the vehicle. Guide seat belts though slots in seat.
2. Seat nuts to studs.

Tighten

- Seat nuts to 45 N.m (33 lb ft).

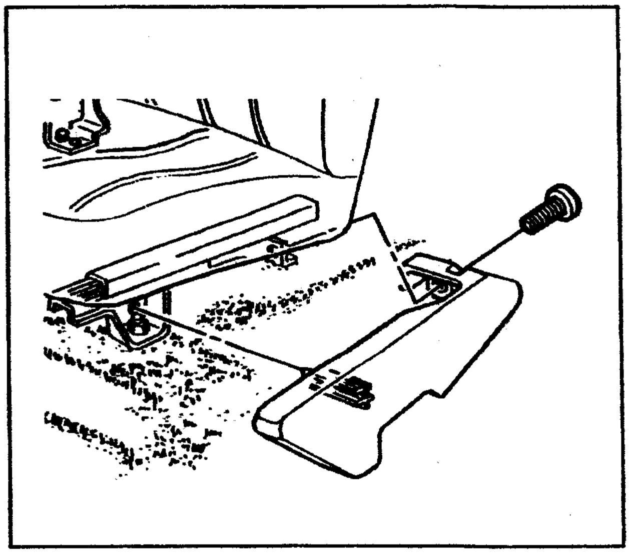


Figure 4—Seat Adjuster Trim Covers

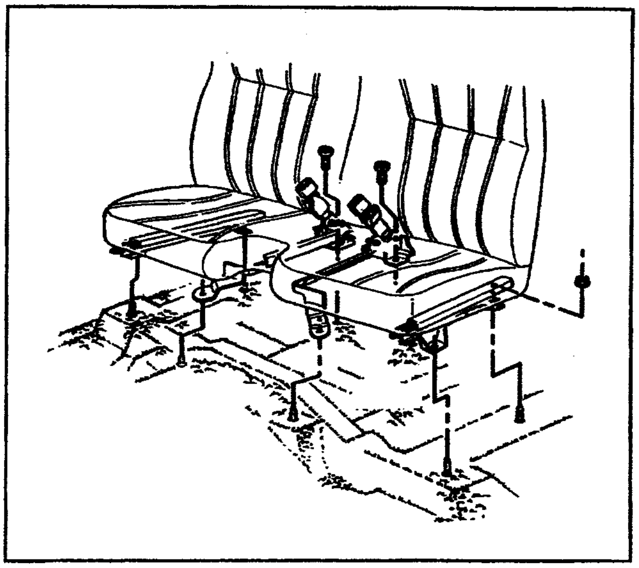


Figure 5—Bench Seat Removal

3. Two bolts to seat rear mounting brackets.

Tighten

- Seat bolts to 70 N.m (52 lb ft).

4. Seat trim covers.

SEAT CUPHOLDER REPLACEMENT (BENCH SEAT)

Remove or Disconnect (Figure 6)

1. Cupholder from bracket.
   - Press retaining tab under cupholder while pulling outward.
2. Rubber pad.

Install or Connect (Figure 6)

1. Rubber pad.
2. Cupholder to bracket.
   - Slide on to bracket and snap into place.

SEAT ADJUSTER ASSEMBLY REPLACEMENT

Adjuster

Remove or Disconnect (Figure 7)

1. Seat from the vehicle
2. Adjuster return spring.
3. Adjuster assembly seat bolts.
4. Trim cover.
5. Lock wire.
6. Adjuster assembly from seat.

Install or Connect (Figure 7)

1. Adjuster to seat.
2. Lock wire to adjuster.
3. Trim cover.
4. Adjuster to seat bolts.

Tighten

- Adjuster to seat bolts to 24 N.m (18 lb ft).

5. Adjuster return spring to seat frame.
6. Seat to vehicle.

SEAT BACK REPLACEMENT

Remove or Disconnect (Figure 8)

1. Seat from the vehicle. Refer to Front Seat Replacement in this section.
2. Seat back pivot bolt.
3. Seat back from the lower frame.

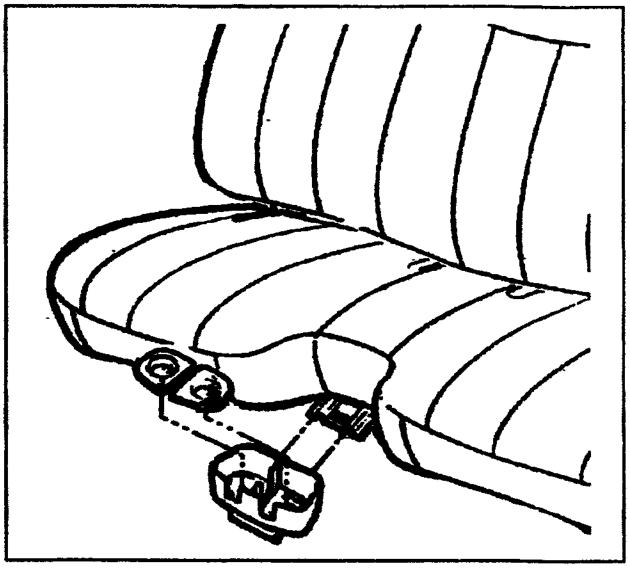


Figure 6—Seat Cupholder

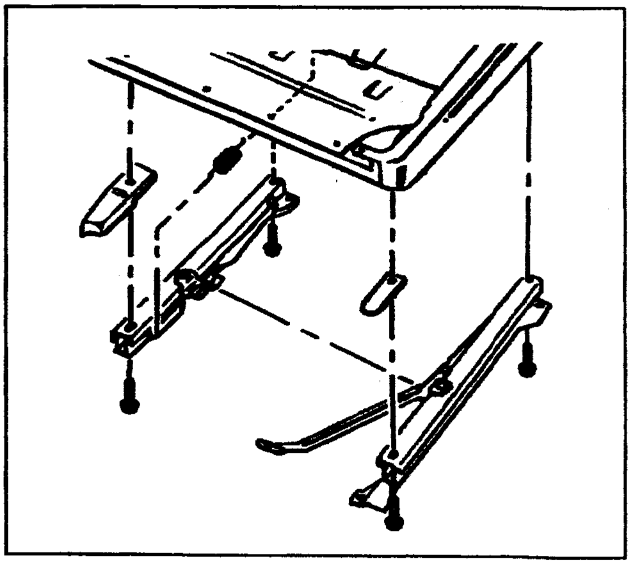


Figure 7—Typical Seat Adjuster Assembly

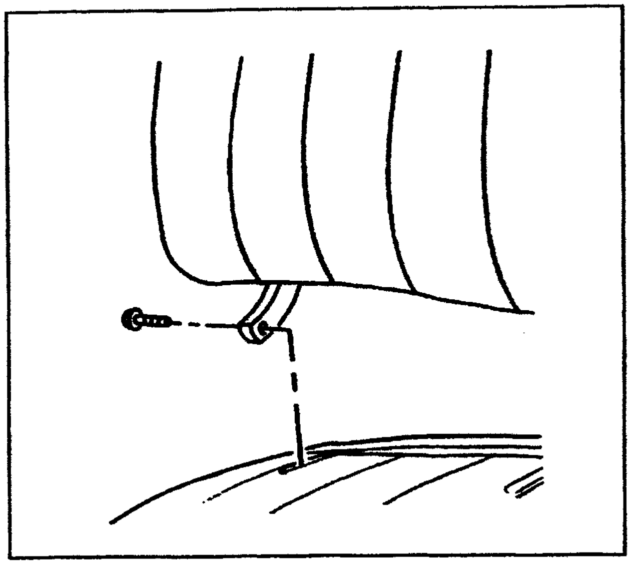


Figure 8—Typical Seat Back

Install or Connect (Figure 8)

1. Seat back to the lower frame.
2. Seat back pivot bolt.

Tighten

- Seat back pivot bolt to 47 N.m (35 lb ft).

3. Seat to the vehicle. Refer to Front Seat Replacement in this section.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N.m	Lb Ft	Lb In
Bench Seat Adjuster Bolts	45	33	—
Bench Seat Back Lock Bolts	10	—	89
Bench Seat Inertia Latch Nut	11	—	97
Floor Anchor Plate Bolt	70	51	—
Seat Trim Cover Screws	1.4	—	13
Seat Back Pivot Bolts	24	18	—
Seat Belt Floor Bolt	53	39	—
Seat Mounting nuts	45	33	—
Track to Seat Bottom Bolts	32	24	—
Upper Anchor Plate Bolt	70	51	—

BLANK

SECTION 10A3

STATIONARY WINDOWS

GENERAL DESCRIPTION

STATIONARY WINDOW SERVICE

When replacing a cracked window, it is important to determine the cause of the crack and correct the condition before installing a new window. The cause of the crack may be an obstruction or high spot somewhere around the flange of the opening. Cracking may not occur until pressure from the high spot or obstruction becomes high due to winds, extreme temperature, or rough terrain. Suggestions of what to look for are described later in this section. Refer to Inspecting the Flange.

If a crack extends to the edge of the window, mark the point where the crack meets the weatherstrip. Use a piece of chalk and mark the point on the body next to the weatherstrip. Later, when examining the flange of the opening for the cause of the crack, start at the point marked.

The higher the temperature of the work area, the more pliable the weatherstrip will be. The more pliable the weatherstrip, the easier it is to remove the windshield.

> NOTICE: ***When cleaning, avoid contacting the edge of the plastic laminate material (on the edge of the window) with volatile cleaner. Contact may cause discoloration and deterioration of the plastic laminate by a wicking action. Do not use a petroleum-based solvent such as kerosene or gasoline. The presence of oil will prevent adhesion of new material.***

ON-VEHICLE SERVICE

WINDSHIELD MOUNTED REAR VIEW MIRROR REPLACEMENT

Mirror

Remove or Disconnect (Figure 1)

1. Slide mirror off of support.
   - Insert a small, regular screwdriver into the slot from the bottom and press slightly to release the tab.

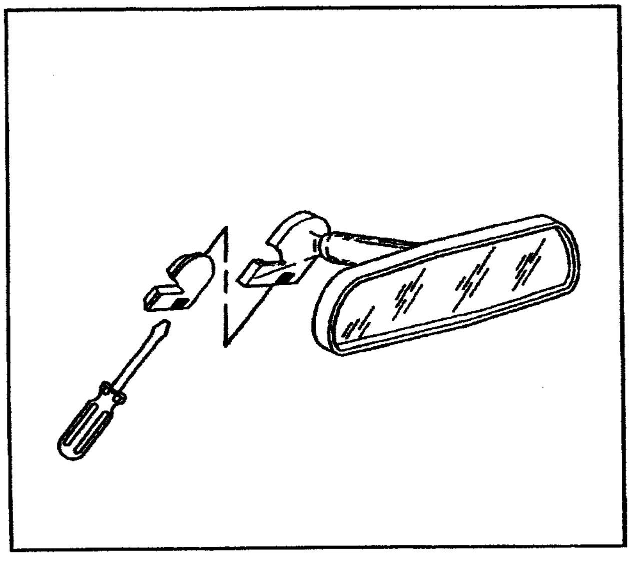


Figure 1—Mirror

Install or Connect

1. Slide mirror on to mirror support.

Mirror Support

Measure (Figure 2)

1. Determine the location of mirror support.
   A. Using a wax pencil, draw a centerline on the outside of the glass from the roof panel to the windshield base.

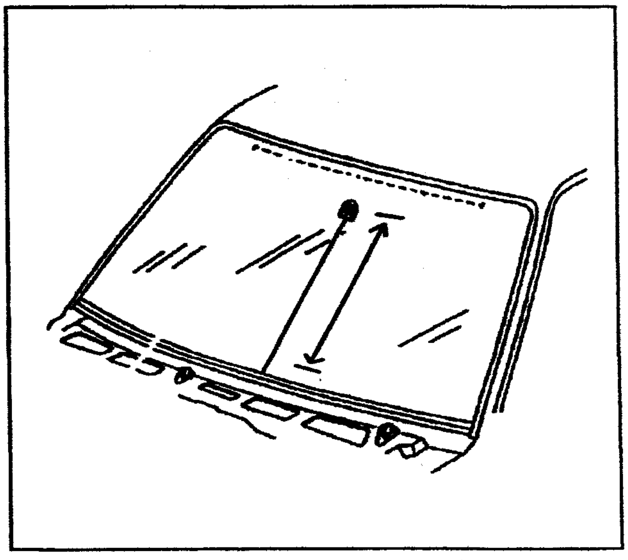


Figure 2—Locating the Mirror Support

B. Draw a line intersecting the centerline 53.4 cm (21 in) from the top of the bottom black-out strip of the glass. The base of the support will be located at the intersection of these lines.

C. Use a razor blade to remove old adhesive from the windshield and support.

Clean

2. The inside glass surface within 76.2 mm (3 in) of the intersecting lines.
   A. Using a glass cleaning solution, rub the area with a paper towel until it is completely clean and dry.
   B. Remove all the traces of the cleaning solution from the glass with an alcohol saturated paper towel.

Install or Connect

3. Mirror support to windshield.
   A. Sand the bonding surface of the rear view mirror support with number 320 or number 360 fine grit emery cloth or sandpaper. If the original rear view mirror support is reused, all traces of the factory installed adhesive must be removed.
   B. Wipe the sanded mirror support with a clean alcohol saturated paper towel. Allow the alcohol to dry.
   C. Apply Loctite® Minute-Bond Adhesive 312 or equivalent to the mirror support. Follow the manufacturer's instructions.
   D. Position the bottom of the support at the marked line. The rounded edge of the support should face upward.
   E. Press the support against the glass for 30 to 60 seconds with a steady pressure. Allow the adhesive 5 minutes to dry before cleaning.

Clean

- Excess adhesive from around the mirror support with an alcohol moistened paper towel.
- Wax marks from the windshield with an alcohol moistened paper towel.

WINDSHIELD REVEAL MOLDING REPLACEMENT

Side Reveal Molding

Remove or Disconnect (Figure 3)

1. Fasteners.
2. Reveal molding from windshield pillar.

Install or Connect

1. Reveal molding to windshield pillar.
2. Fasteners.

Upper Reveal Molding Replacement

Remove or Disconnect (Figure 4)

1. Windshield side reveal molding. Refer to Side Reveal Molding Replacement in this section.
2. Carefully pry end of upper reveal molding assembly out about 76.2 mm (3 in), using a flat-bladed tool.
3. Grasp with pliers and slowly pull reveal molding assembly from the body.

Inspect Reveal Molding Assembly.

- If original reveal molding assembly cannot be reused (due to damage, cut short, etc.), discard it and replace it with a new service reveal molding assembly. Be sure to prefit the service reveal molding by locating it on the body prior to installation.

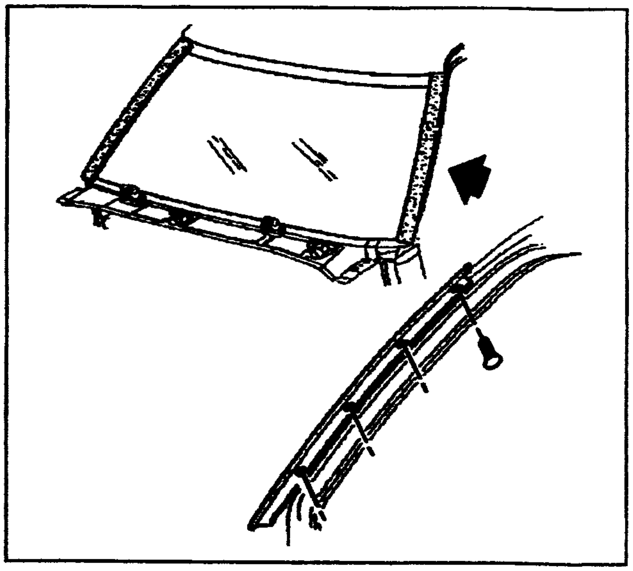


Figure 3—Windshield Side Reveal Molding

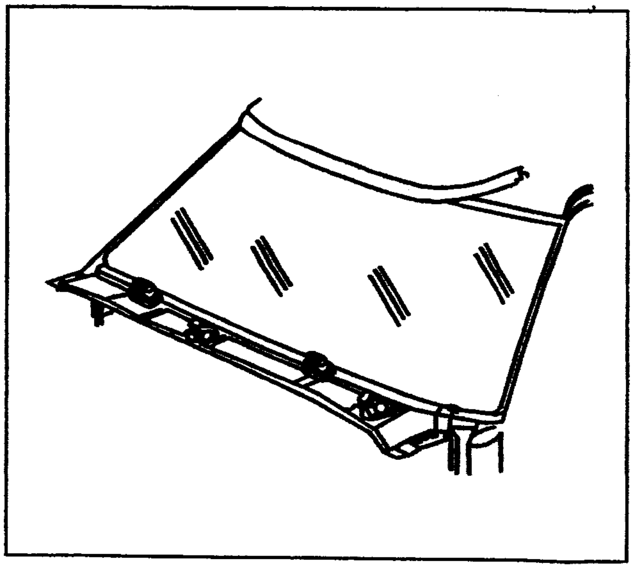


Figure 4—Windshield Upper Reveal Molding

Clean

- Window assembly of all traces of urethane, using alcohol-dampened cloth.

Install or Connect

1. Clear primer from urethane adhesive kit GM P/N 12346284 or equivalent in glass edge channel of reveal molding assembly.
2. Black primer from urethane adhesive kit GM P/N 12346284 or equivalent over clear primer.
3. Urethane adhesive from kit GM P/N 12346284 or equivalent evenly in glass edge channel of reveal molding over black primer.
4. Upper reveal molding assembly.
5. Window side reveal molding.
   A. Start from the center and hand press reveal molding assembly in place over edge of windshield assembly.
   B. Pour warm water over reveal molding assembly to speed setup time of adhesive.
      - Tape can be applied to hold reveal molding flush with the body.

NOTICE: ***To ensure the proper cure time for urethane adhesive, allow the vehicle to remain at room temperature, 22 degrees C (72 degrees F), at 30% relative humidity for a minimum of six hours.***

WINDSHIELD REPLACEMENT

Windshield assemblies are installed from the outside of the body using self-curing adhesive. Replacing a windshield assembly installed with urethane adhesive requires either partial or complete replacement of the adhesive. Partial replacement of adhesive is known as the short method. Complete replacement of the adhesive is known as the extended method.

Windshield assembly removal is the same for both the short and extended installation methods with one exception. Use more care with the short method while cutting out to make certain that an even bead of adhesive remains on the windshield opening to serve as a base for the new windshield assembly.

Refer to Adhesive Application for Short Method and Extended Method, in this section for further information about adhesive application procedures.

Removal

CAUTION: Always wear heavy gloves when handling window to minimize the risk of injury.

Tools required:
J 24402-A Glass Sealant Remover (Cold Knife) or,
J 24709-1 Glass Sealant Remover (Hot Knife)-115 Volt or,
J 39032 Stationary Glass Removal Tool
J 24811-A Urethane Adhesive Dispensing Gun

Remove or Disconnect (Figure 5 and 7)

NOTICE: ***If a window is cracked but still intact, it should be crisscrossed with masking tape to reduce the risk of damage to the vehicle. If a crack extends to the edge of the window, mark the body with a piece of chalk at the point where the crack meets the body.***

- Place protective coverings around the window removal area.

1. Rearview mirror. Refer to Windshield Mounted Rearview Mirror Replacement in this section.
2. Windshield wipers. Refer to Windshield Wiper/Washer System (Pulse).
3. Cowl vent grille. Refer to Sheet Metal.

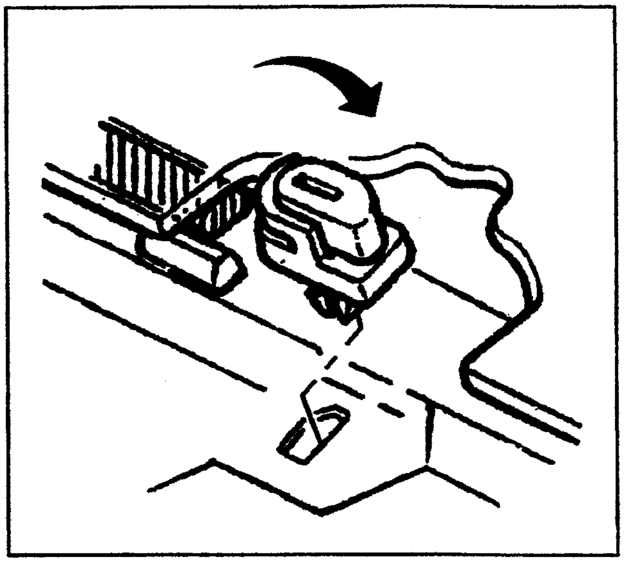


Figure 5—Lower Windshield Support

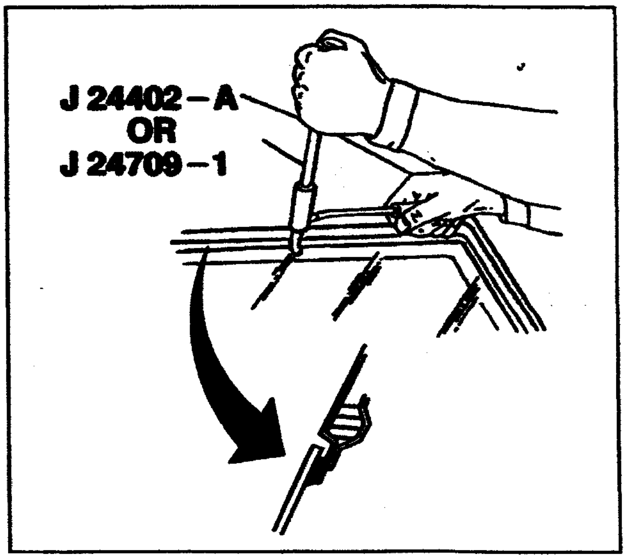


Figure 6—Typical Hot or Cold Knife Adhesive Removal

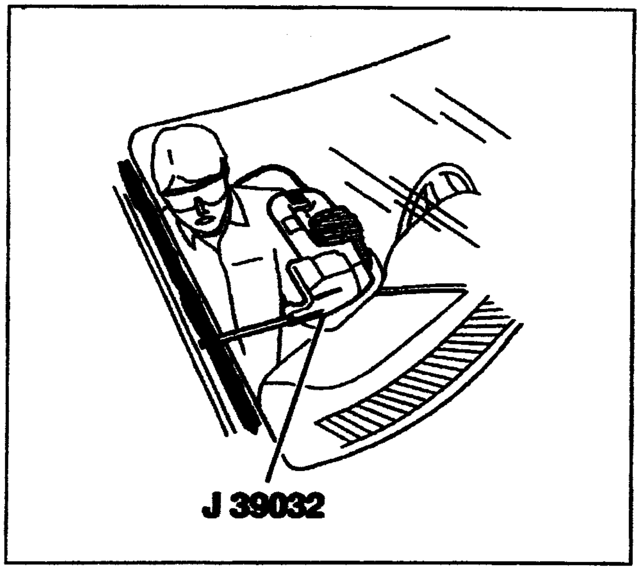


Figure 7—Stationary Glass Power Tool Removal

4. Lower windshield supports (Figure 5).
   - Squeeze bottom retainers.
5. Reveal moldings. Refer to Windshield Reveal Molding Replacement in this section.
6. Excess urethane adhesive from the cavity between the window edge and the window frame.
   - Use a razor or utility knife to trim the adhesive.
7. Window from the flange.
   A. Use J 24402-A, or J 24709-1, or J 39023 to cut the window from the urethane adhesive (Figure 6 or 7). Keep the cutting edge of the knife against the window and cut the sealant from the windshield. If the short method of window replacement is used, use care during cutting to make certain that an even bead of adhesive remains on windshield opening to be used as a base for new windshield assembly.
   B. With the aid of an assistant, remove the windshield.

Inspecting the Flange

Inspect

- Inspecting the flange of the windshield opening, weatherstrip, and window may reveal the cause of a broken windshield. This can help prevent future breakage. If there is no apparent cause of breakage, remove the weatherstrip from the flange of the opening and inspect the flange. Look for high weld or solder spots, hardened spot weld sealer, or any other obstruction or irregularity in the flange. Check the weatherstrip for irregularities or obstructions.
- Before installing a windshield, make sure it does not have any chipped edges. Chipped edges can be ground off to restore a smooth edge to the window and minimize concentrations of pressure that cause breakage. Remove no more than necessary. This helps maintain the original shape of the window and the proper clearance between it and the flange opening.

Adhesive Application

CAUTION: When replacing stationary glass, urethane adhesive GM P/N 12346284 or equivalent must be used to maintain original installation integrity. Failure to use urethane adhesive will result in poor retention of the windshield which may allow unrestrained occupants to be ejected from the vehicle with resulting personal injury.

NOTICE: ***Glass installation requires a number of timed steps because of the cure times involved with the primers, solvents, and adhesives used in this procedure. This timing is important and instructions supplied with kit must be followed.***
Two primers are provided in the urethane adhesive kit GM P/N 12346284 or equivalent, a clear glass primer and a black primer. The clear primer is always applied to glass before the black primer. Once the clear primer is applied, it is important to wipe off excess immediately. This primer dries almost instantly and will stain viewing area of the glass, so be sure to apply it evenly and keep it away from viewing area.

Short Method

This method can be used only when the original urethane adhesive and black primer is left on the window opening (flange) area. The old adhesive and black primer serve as a base for the new urethane adhesive.

Clean

1. Clean loose or partially cut adhesive from the pinch weld flange using a brush or razor.
   - Do not scrape away old adhesive down to reveal paint.
   - If the urethane adhesive, pinch weld primer, or paint has been removed from the pinch weld area they must be replaced.
   - If old windshield assembly is to be reinstalled, all old urethane adhesive must be removed from it.

Inspect

- Pull upward on old adhesive to make sure that there is no loose adhesive left on flange.

Adjust

1. Temporarily position the glass in the flange to check glass fit.
   - Install upper reveal molding (windshield glass only) (Figure 8).
   - Install lower supports (windshield glass only) (Figure 5).
   - Install glass.
2. Center and align glass.

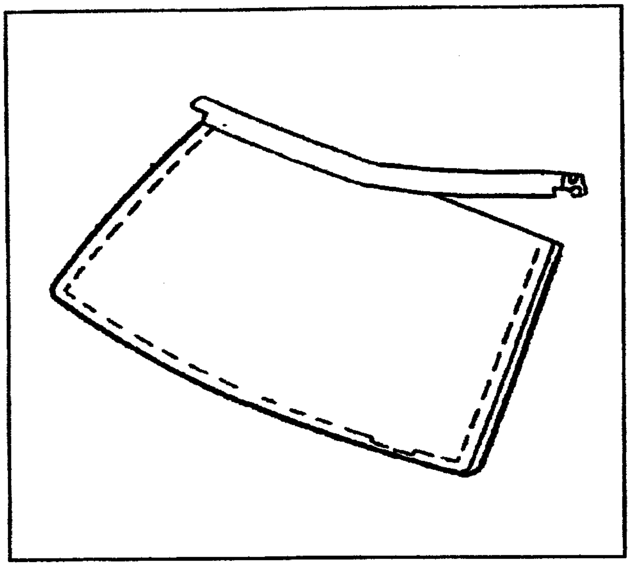


Figure 8—Reveal Molding Installation

3. Apply masking tape over glass assembly edges and adjacent body pillars to mark its position.
4. Slit tape between window assembly and body pillars.
5. Remove the glass from the vehicle.

Install or Connect

1. Clean area of glass to which adhesive will be applied by wiping with a clean, alcohol-dampened cloth.
2. Using a clean, lint-free cloth, apply clear primer from urethane adhesive kit GM P/N 12346284 or equivalent 16 mm (0.629 in) wide around all edges of glass 1 mm (0.039 in) inboard from upper reveal molding, 8 mm (0.315 in) from bottom of glass and 10.5 mm (0.413 in) inboard from the left and right sides of glass, then immediately wipe off (Figure 9).
   - Clear primer must be reapplied if the elapsed time between clear primer application and black primer application exceeds 30 minutes. Do not apply clear primer over black primer.
3. Apply a smooth continuous bead of urethane adhesive to primed glass areas using a caulk gun J 24811 or equivalent (Figure 9 and 10).
   - Before applying the black primer make sure the clear primer is not dirty and is still intact.
   - Allow the black primer to dry to the touch. If the black primer is allowed to dry longer than 100 hours it must be re-applied.
4. Urethane adhesive to the primed area (Figures 9 and 10).
   - Apply a smooth continuous bead of adhesive using a caulk gun J 24811 or equivalent.

NOTICE: ***To ensure the proper cure time for urethane adhesive, allow the vehicle to remain at room temperature, 22 degrees C (72 degrees F), at 30% relative humidity for a minimum of six hours.***

Extended Method

The extended method requires that all old urethane adhesive be completely removed from glass opening. This method is used only for extreme cases such as:

- When the old urethane adhesive can no longer serve as a good base.
- When there is damage to the glass opening.
- When there is a need for the glass opening to be repainted in a body shop.

Install or Connect

1. Clean glass and glass opening flange.
   - Using sharp scraper or chisel, remove old adhesive materials from glass opening mounting surfaces. Some traces of material may stay on flange, but there should not be any mounds or loose pieces.

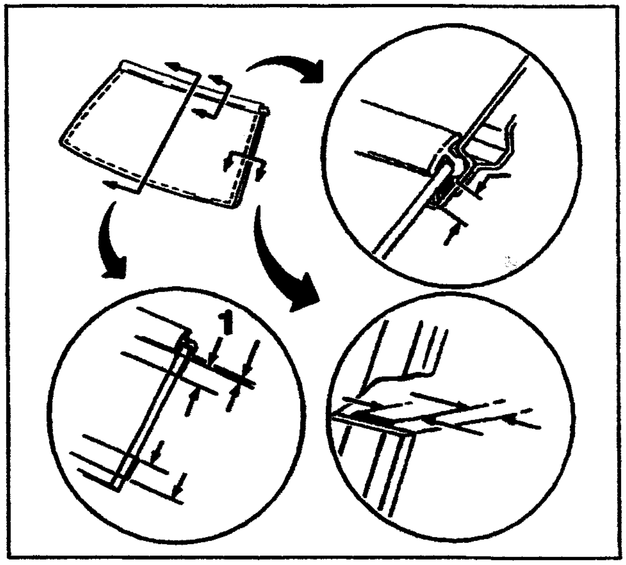


Figure 9—Primer and Adhesive Application to Window

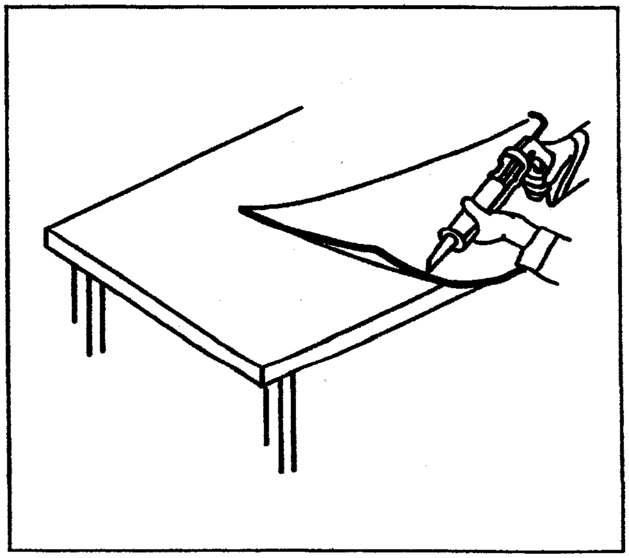


Figure 10—Applying Urethane Adhesive

- Use a razor to remove all of the adhesive from the glass.
- Apply sheet corrosion resistant primer and paint to any exposed sheet metal.

Adjust

1. Temporally position the glass in the flange to check glass fit.
   - Install upper reveal molding (windshield glass only) (Figure 8).
   - Install lower supports (windshield glass only) (Figure 5).
   - Install glass.
2. Center and align glass.
3. Apply masking tape over glass assembly edges and adjacent body pillars to mark its position.
4. Slit tape between window assembly and body pillars.
5. Remove the glass from vehicle.

Install or Connect

1. Clean area of glass to which adhesive will be applied by wiping with a clean, alcohol-dampened cloth and allow to air dry.
2. Using a clean, lint-free cloth, apply clear primer from urethane adhesive kit GM P/N 12346284 or equivalent 16 mm (0.629 in) wide around all edges of glass 1 mm (0.039 in) inboard from upper reveal molding, 8 mm (0.315 in) from bottom of glass and 10.5 mm (0.413 in) inboard from the left and right sides of glass, then immediately wipe off (Figure 9).
   - Clear primer must be reapplied if the elapsed time between clear primer application and black primer application exceeds 30 minutes. Do not apply clear primer over black primer.
3. Using a small brush, apply black primer to glass over the same area that the clear primer was just applied (Figure 9 and 10).
   - Before applying the black primer make sure the clear primer is not dirty and is still intact.
   - Allow the black primer to dry to the touch. If the black primer is allowed to dry longer than 100 hours it must be re-applied.
4. Apply black primer to windshield flange (Figure 11).
   - Allow the black primer to dry to the touch. If the black primer is allowed to dry longer than 100 hours it must be re-applied.
5. Apply a smooth continuous bead of adhesive to primed glass areas using a caulk gun J 24811 (Figure 9 and 10).
   - Before applying the black primer make sure the clear primer is not dirty and is still intact.
   - Allow the black primer to dry to the touch. If the black primer is allowed to dry longer than 100 hours it must be re-applied.

Installation

Install or Connect

1. Apply spacers to A-pillar (Figure 12).
   - Remove tape backing.
2. With the aid of a helper, place the window on the lower supports (Figure 12).
3. Align window with marks.
4. Center the window in the opening to leave an even gap around the edge of the window for the reveal molding.
5. Center the window into the windshield opening. Push window upward against the roof (Figure 13).
6. Apply a light hand pressure to the window to wet-out the adhesive and bond the window to the pinch-weld flange. Continue to apply pressure until the window is seated against the spacers (Figure 13).

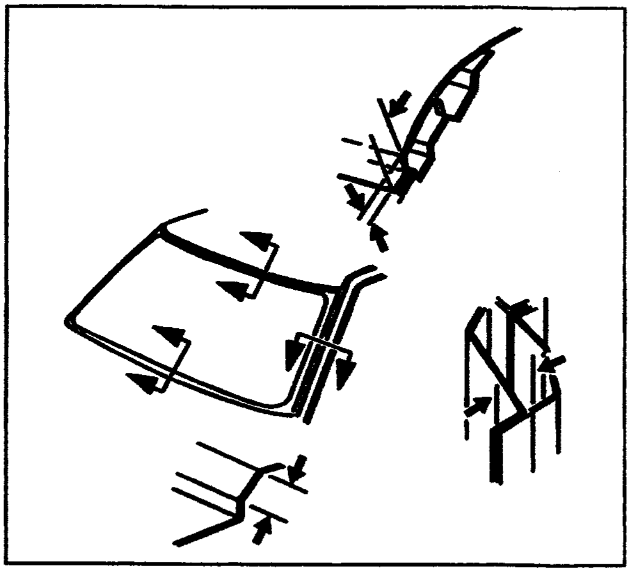


Figure 11—Black Primer Application to Flange

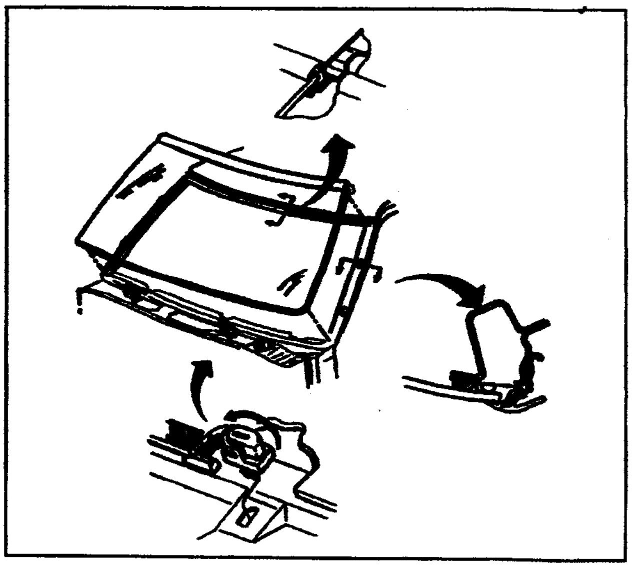


Figure 12—Windshield Installation

7. Turn lower support adjuster with a screw driver to maintain windshield position (Figure 5).

Inspect

- Test the window for leaks with a light steady stream of warm or hot water to speed setup time of adhesive. Do not run a heavy stream of water directly onto the freshly applied adhesive. If any leaks are found, work additional adhesive material into that area.

8. Window reveal moldings.
9. Windshield wipers.
10. Cowl vent grille.
11. Mirror.

Adjust

- The vehicle must remain at normal room temperature for 6 hours to complete the proper cure of the adhesive. Close doors slowly until adhesive cures.

REAR STATIONARY WINDOW REPLACEMENT

Window assemblies are installed from the outside of the body using self-curing adhesive. Replacing a window assembly installed with urethane adhesive requires either partial or complete replacement of the adhesive. Partial replacement of the adhesive is known as the short method. Complete replacement of the adhesive is known as the extended method.

Window assembly removal is the same for both the short and extended installation methods with one exception. Use more care with the short method while cutting out to make certain that an even bead of adhesive remains on the window opening to serve as a base for the new window assembly.

Refer to Adhesive Application for Short Method or Extended Method in this section for adhesive application procedures.

Remove or Disconnect (Figure 14)

CAUTION: Always wear heavy gloves when handling glass to minimize the risk of injury.

NOTICE: ***If a window is cracked but still intact, it should be crisscrossed with masking tape to reduce the risk of damage to the vehicle.***

Tools Required:
J 24402-A Glass Sealant Remover (Cold Knife) or,
J 24709-1 Glass Sealant Remover (Hot Knife)-115 Volt or,
J 39032 Stationary Window Removal Tool

- Place protective coverings around the window removal area.

1. Rear window interior trim moldings. Refer to Interior Trim.
2. Cut out window using hot knife J 24709-1 or cold knife J 24402-A or J 39032 stationary glass removal power tool or equivalent (Figure 6 or 7).
   A. Use tape to hold window in place while cutting.
   B. Insert the blade between the window and the urethane.
   C. Keep the blade against the window edge and cut the sealant from the window.
   D. Keep the blade against the glass edge and cut the sealant from the window.

Install or Connect

1. Glass adhesive (Figure 14). Refer to Adhesive Application under Windshield Replacement in this section for adhesive procedures.
2. Window to vehicle.
   A. With the aid of a helper, align glass with body sheet metal. Then place the glass in the window frame.

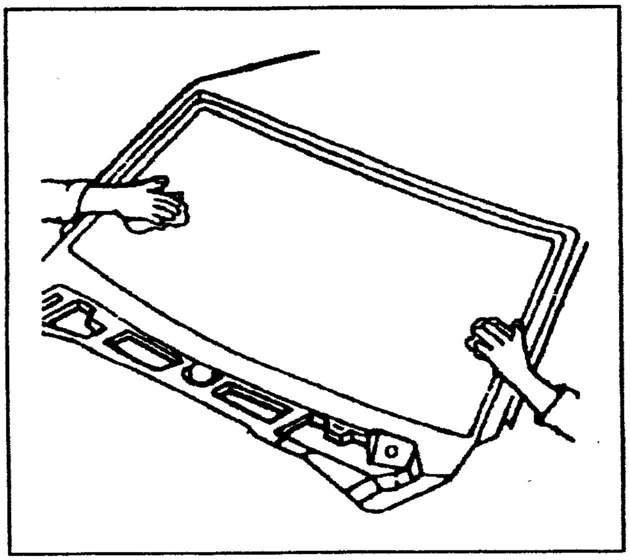


Figure 13—Apply Pressure

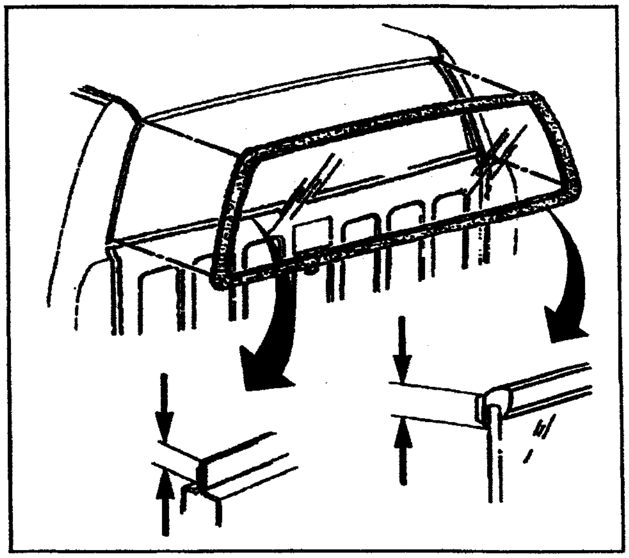


Figure 14—Rear Window

B. Apply a light hand pressure to the glass to wet-out the adhesive and bond the glass to the window frame.

C. Test the window for leaks with a light steady stream of warm or hot water. Do not run a heavy stream of water directly onto the freshly applied adhesive. If any leaks are found, work additional adhesive material into that area.

3. Rear window interior trim panels.

Adjust

- The vehicle must remain at normal room temperature for 6 hours to complete the proper cure of the adhesive. Close doors slowly until adhesive cures.

WINDOW POLISHING

Minor Scratch and Abrasion Removal

Minor scratches and abrasions can be removed or reduced by following the procedure outlined below. Take precautions to prevent distortions of vision. Double vision may result if an attempt is made to remove deep scratches. Deep scratches should not be removed from an area in the driver's line of vision. In such cases, the glass should be replaced.

The procedure that follows was developed using a cerium oxide compound. Follow the manufacturer's directions if other materials are used.

Recommended Equipment

- A low-speed (600-1300 RPM) rotary polisher.
- A wool felt, rotary polishing pad 76.2 mm (3 in) in diameter and 51 mm (2 in) thick.
- Powdered cerium oxide mixed with water. This is the abrasive compound.
- A wide-mouth container to hold the abrasive compound.

Polishing Procedure (Figure 15)

1. Mix at least 44 ml (1.5 oz) of cerium oxide with enough water to obtain a creamy consistency. (If the mixture is too thick it will cake on the felt pad more quickly. If it is too runny, more polishing time will be needed.)
2. Draw a circle around the scratches on the opposite side of the glass with a marking crayon or equivalent.
3. Draw a line directly behind the scratch to serve as a guide for locating the scratch while polishing.
4. Cover the surrounding area with masking paper to catch the drippings or spattered polish.

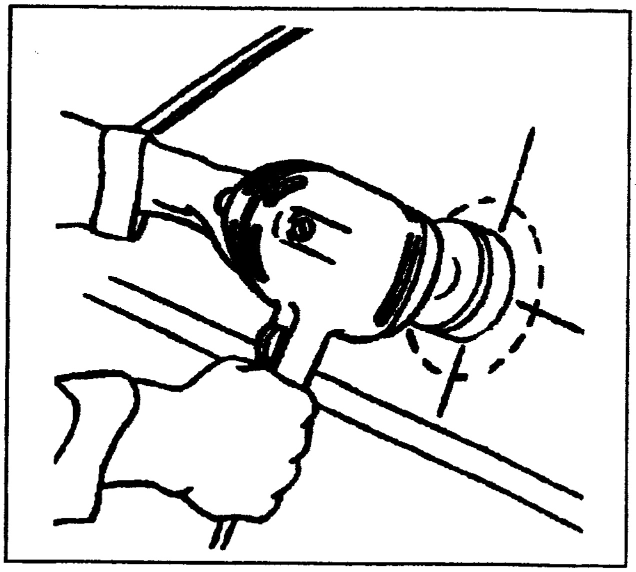


Figure 15—Glass Polishing

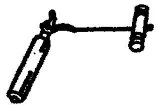
5. Dip the felt pad attached to the polisher into the mixture. Do not submerge the pad or allow the pad to stay in the mixture as it may loosen the bond between the pad and the metal plate.

NOTICE: ***Never hold the tool in one spot or operate the tool on the glass any longer than 30 to 45 seconds. If the glass becomes hot to touch, let it air cool before proceeding further. Cooling with cold water may crack the heated glass. Avoid excessive pressure. It may cause overheating of the glass.***

6. Polish the scratched area, but note the following:
   - Agitate the mixture as often as needed to maintain the creamy consistency of the compound.
   - Use moderate but steady pressure.
   - Hold the pad flat against the glass.
   - Use a feathering-out motion.
   - Dip the pad into the mixture every 15 seconds to ensure that the wheel and the glass are always wet during the polishing operation. (A dry pad causes excessive heat to develop.)
   - Keep the pad free of dirt and other foreign substances.
7. After removing the scratch, wipe the area clean of any polish.
8. Clean the polishing pad.

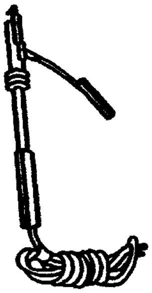
SPECIAL TOOLS

1.



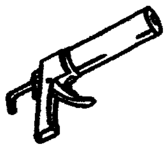
J 24402-A

2.



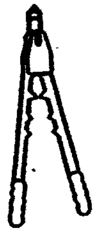
J 24709-01

3.



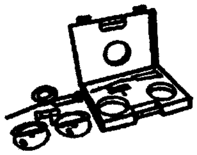
J 24811-A

4.



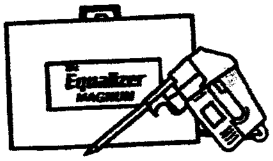
J 34940

5.



J 36863

6.



J 39032

1. J 24402-A GLASS SEALANT REMOVER (COLD KNIFE)
2. J 24709-01 GLASS SEALANT REMOVER (HOT KNIFE)
3. J 24811-A URETHANE ADHESIVE DISPENSING GUN
4. J 34940 RIVET GUN
5. J 36863 GLASS REMOVAL KIT
6. J 39032 STATIONARY GLASS REMOVAL TOOL

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BLANK

SECTION 10A4

INTERIOR TRIM

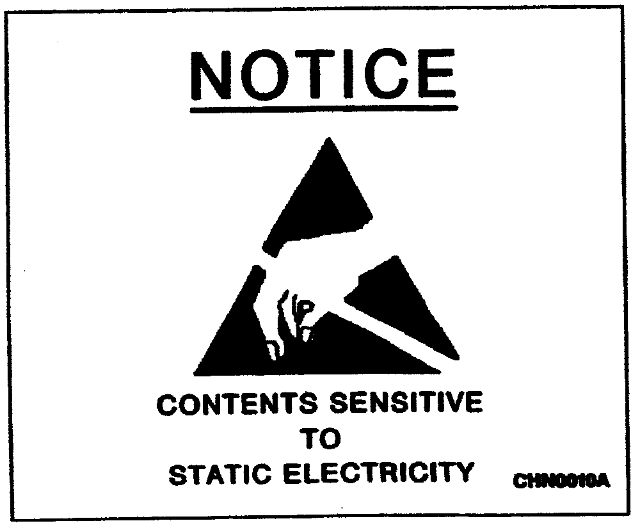
ON-VEHICLE SERVICE

HANDLING ELECTROSTATIC DISCHARGE (ESD) SENSITIVE PARTS

Many solid state electrical components can be damaged by electrostatic discharge (ESD). Some will display a label, but many will not (Figure 1).

In order to avoid possibly damaging any components, observe the following:

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
   - Slide across the vehicle seat.
   - Sit down or get up.
   - Do any walking.
2. Do not touch exposed electrical terminals on components with your fingers or any tools. Remember, the connector that you are checking might be tied into a circuit that could be damaged by electrostatic discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or between the exposed terminals.
4. Never use a jumper wire, ground, or use test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install the part.
6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if:
   - They are bumped or dropped.
   - They are laid on any metal work bench or near electrical components, such as a television, radio, or oscilloscope.



NOTICE

CONTENTS SENSITIVE
TO
STATIC ELECTRICITY

Figure 1—Electrostatic Discharge Label

INSTRUMENT PANEL STORAGE COMPARTMENT DOOR AND BEZEL REPLACEMENT

↔ Remove or Disconnect

1. Right side instrument panel sound insulator. Refer to Instrument Panel Sound Insulators in this section.
   - Push up on the J-spring to release the storage compartment door.
2. Screws that retain the instrument panel compartment door hinges to the instrument panel.
3. Instrument panel storage compartment door from the instrument panel.
4. Screws that retain the instrument panel compartment bezel to the instrument panel.
5. Instrument panel compartment bezel from the instrument panel.

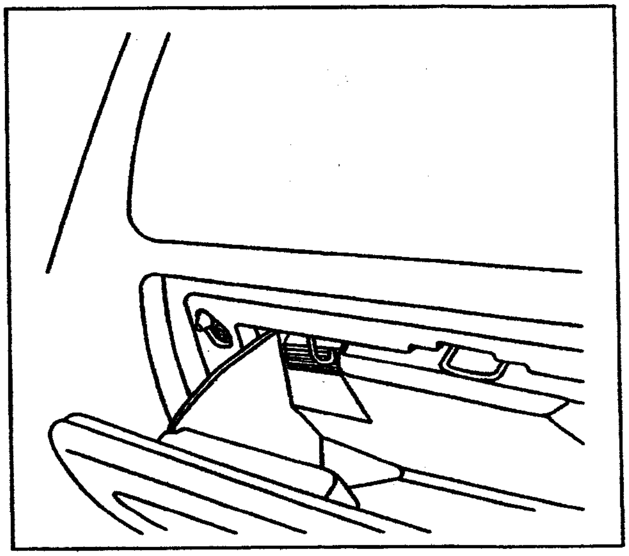


Figure 2—Storage Compartment Door "J-Spring"

6. Electrical connector from the instrument panel compartment lamp and switch assembly.

Install or Connect

1. Electrical connector to the instrument panel compartment lamp and switch assembly.
2. Storage compartment bezel to the instrument panel.
3. Screws that retain the instrument panel compartment bezel to the instrument panel.

Tighten

- Screws to 1.9 N.m (17 lb in).

4. Instrument panel storage compartment door to the instrument panel.
5. Screws that retain the instrument panel compartment door hinges to the instrument panel.

Tighten

- Screws to 1.9 N.m (17 lb in).

6. Push Storage compartment into place.
7. Right side instrument panel sound insulator. Refer to Instrument Panel Sound Insulators in this section.

INSTRUMENT PANEL SOUND INSULATOR REPLACEMENT

Left Side

Remove or Disconnect (Figure 3)

1. Screws that retain the data link connector (DLC) to the instrument panel sound insulator.
   - Feed the DLC through the hole in the sound insulator.
2. Screws that retain the instrument panel sound insulator to the knee bolster and cowl panel.
3. Nut that retains the instrument panel sound insulator to the accelerator pedal bracket.
4. Remote control door lock receiver module electrical connector.
5. Remote control door lock receiver module from the instrument panel sound insulator.

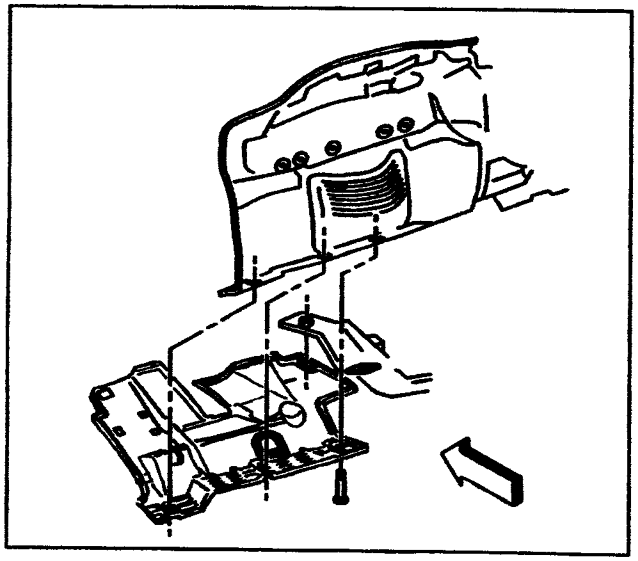


Figure 3—Left Side Instrument Panel Sound Insulator

Install or Connect (Figure 3)

1. Remote control door lock receiver module to the instrument panel sound insulator.
2. Remote control door lock receiver module electrical connector.
3. Nut that retains the instrument panel sound insulator to the accelerator pedal bracket.

Tighten

- Nut to 4 N.m (35 lb in).

4. Screw that retains the instrument panel sound insulator to the cowl panel.

Tighten

- Screw to 1.9 N.m (17 lb in).

5. Screws that retains the instrument panel sound insulator to the knee bolster.

Tighten

- Screws to 1.9 N.m (17 lb in).

6. DLC through the hole in the instrument panel sound insulator.
7. Screws that retain the DLC to the instrument panel sound insulator.

Tighten

- Screws to 2.4 N.m (21 lb in).

Center

Remove or Disconnect (Figure 4)

1. Screws that retain the instrument panel sound insulator to the knee bolster, instrument panel, heater assembly, and floor duct.
2. Instrument panel sound insulator from the vehicle.

Install or Connect (Figure 4)

1. Instrument panel sound insulator to the vehicle.
2. Screws that retain the instrument panel sound insulator to the knee bolster, instrument panel, and floor duct.

Tighten

- Screws to 1.9 N.m (17 lb in).

3. Screw that retains the instrument panel sound insulator to the heater assembly.

Tighten

- Screw to 1.5 N.m (13 lb in).

Right Side

Remove or Disconnect (Figure 5)

1. Screws that retain the instrument panel sound insulator to the instrument panel and cowl.
2. Instrument panel sound insulator from the vehicle.

Install or Connect (Figure 5)

1. Instrument panel sound insulator to the vehicle.
2. Screws that retain the instrument panel sound insulator to the instrument panel and cowl.

Tighten

- Screws to 1.9 N·m (17 lb in).

KNEE BOLSTER REPLACEMENT

Remove or Disconnect (Figure 6)

1. Set the parking brake and block the wheels.
2. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
3. Release the parking brake release cable from the parking brake lever.
4. Left-side and center instrument panel sound insulators. Refer to Instrument Panel Sound Insulators in this section.
5. Screw that retains the courtesy lamp to the knee bolster.
6. Screws that retain the knee bolster to the instrument panel.
7. Lap cooler duct.
8. Lighter outlet electrical connector.
9. Knee bolster from the vehicle.

Install or Connect (Figure 6)

1. Lighter outlet electrical connector.
2. Lap cooler duct.
3. Knee bolster to the vehicle.
4. Screws that retain the knee bolster to the instrument panel.

Tighten

- Torx® head screws to 9 N·m (80 lb in).

Tighten

- Hex head screws to 1.9 N·m (17 lb in).

5. Courtesy lamp and screw that retains the courtesy lamp to the knee bolster.

Tighten

- Screw to 1.9 N·m (17 lb in).

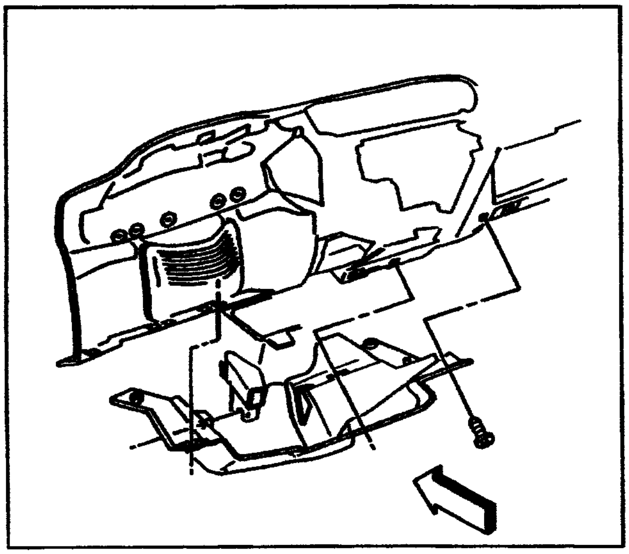


Figure 4—Center Instrument Panel Sound Insulator

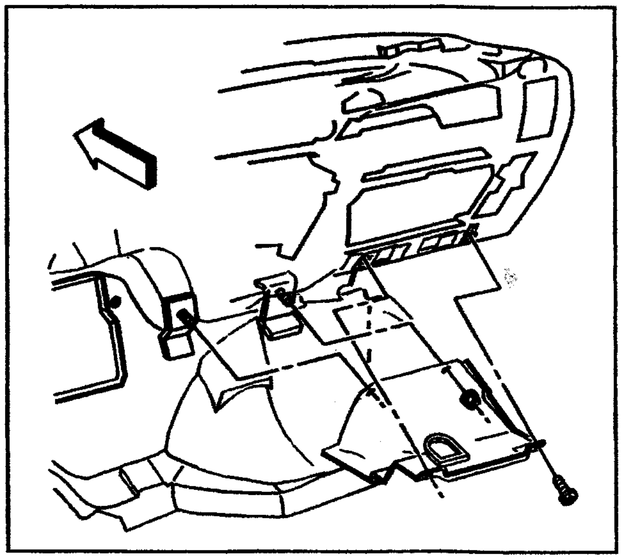


Figure 5—Right Side Instrument Panel Sound Insulator

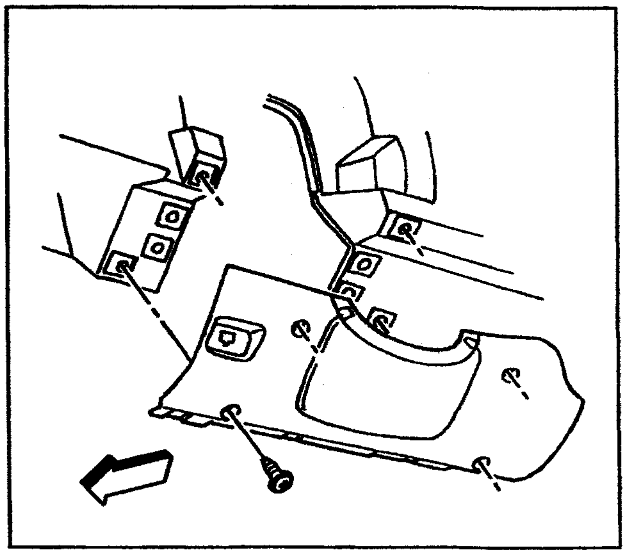


Figure 6—Knee Bolster

6. Left-side and center instrument panel sound insulators. Refer to Instrument Panel Sound Insulators in this section.
7. Parking brake release cable to the parking brake lever.
8. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

INSTRUMENT PANEL ACCESSORY TRIM PLATE REPLACEMENT

Remove or Disconnect (Figure 7)

1. Negative battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.
2. Left instrument panel sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
3. Knee bolster. Refer to Knee Bolster Replacement in this section.
4. Disable the SIR system. Refer to Disabling the SIR System in Restraints.
5. Nuts that retain the steering column to the vehicle.
   - Lower the steering column for clearance.
6. Screws that retain the instrument panel accessory trim plate to the instrument panel.
7. Instrument panel accessory trim plate.
8. Electrical connectors as necessary.

Install or Connect (Figure 7)

1. Electrical connectors as necessary.
2. Instrument panel accessory trim plate.
3. Screws that retain the instrument panel accessory trim plate to the instrument panel.

Tighten

- Screws to 1.9 N·m (17 lb in).

4. Raise the steering column into place and attach with mounting nuts.

Tighten

- Nuts to 30 N·m (22 lb ft).

5. Enable the SIR system. Refer to Enabling the SIR System in Restraints.
6. Knee bolster. Refer to Knee Bolster Replacement in this section.
7. Left instrument panel sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
8. Negative Battery cable. Refer to Battery Disconnect Caution in Cautions and Notices.

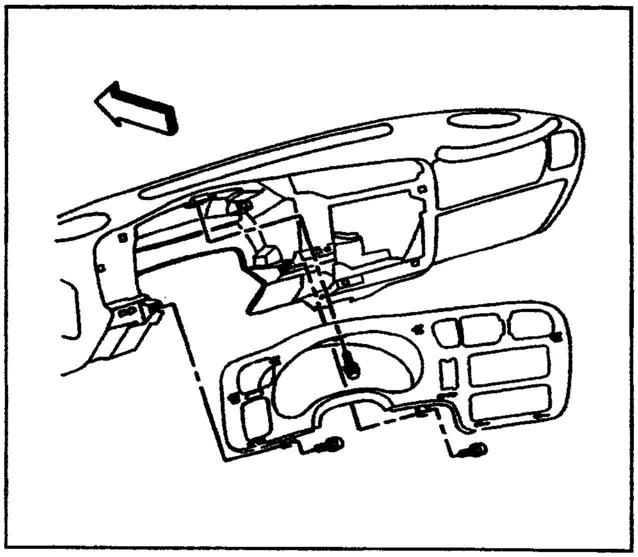


Figure 7—Instrument Panel Accessory Trim Plate

KNEE DEFLECTOR REPLACEMENT

Remove or Disconnect (Figure 8)

1. Left sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
2. Knee bolster. Refer to Knee Bolster Replacement in this section.
3. Disable the SIR system. Refer to Disabling the SIR System in Restraints.
4. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement in this section.
5. Nuts that retain the knee deflector to the magnesium beam.
6. Knee deflector from studs

Install or Connect (Figure 8)

1. Knee deflector on to studs.
2. Nuts that retain the knee deflector to the magnesium beam.

Tighten

- Nuts to 10 N·m (89 lb in).

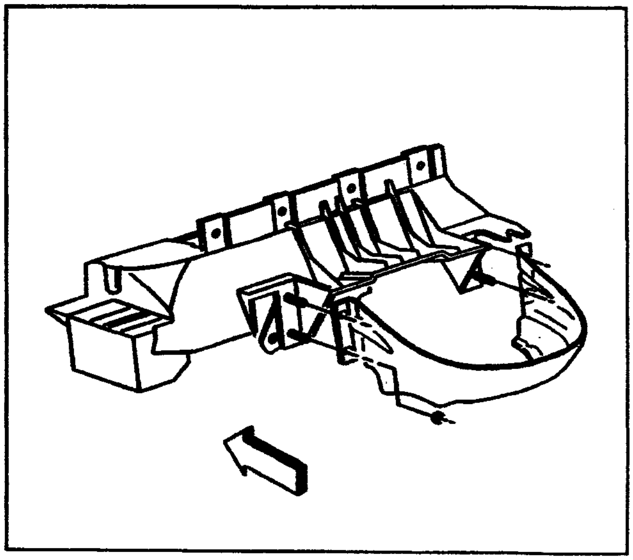


Figure 8—Knee Deflector

3. Instrument panel accessory trim plate. Refer to Instrument Panel Accessory Trim Plate Replacement.
4. Enable the SIR. Refer to Enabling the SIR System in Restraints.
5. Knee bolster. Refer to Knee Bolster Replacement.
6. Left sound insulator. Refer to Left Sound Insulator Replacement.

PASSENGER INFLATABLE RESTRAINT REPLACEMENT

↔ Remove or Disconnect

1. Instrument panel. Refer to Instrument Panel Replacement in this section.
2. Screws that retain inflatable restraint module to instrument panel.
3. Inflatable restraint module from instrument panel.

→← Install or Connect

1. Inflatable restraint module to instrument panel.
2. Screws that retain inflatable restraint module to instrument panel.

   Tighten

   - Screws to 1.9 N·m (17 lb in).

3. Instrument panel. Refer to Instrument Panel Replacement in this section.

HEADLINER REPLACEMENT

↔ Remove or Disconnect (Figures 9 through 11)

1. Dome lamp. Refer to Dome Lamp Replacement in Lighting Systems.
   - Let the dome lamp hang down.
2. Coat hooks. Refer to Coat Hook Replacement in this section.
3. Passenger assist handle. Refer to Assist Handle Replacement in this section.
4. Sunshades and retainers. Refer to Sunshade and Retainer Replacement in this section.
5. Windshield garnish moldings. Refer to Windshield Garnish Molding Replacement in this section.
6. Rear side door upper latch cover, if equipped.
7. Pull the body side trim panels loose at the roof line.
8. Headliner from the vehicle.
   A. Grasp the headliner at the front.
   B. Use a downward motion to disengage the hook and loop fasteners at the rear.
   C. Slide the headliner forward, past the body side trim panels.

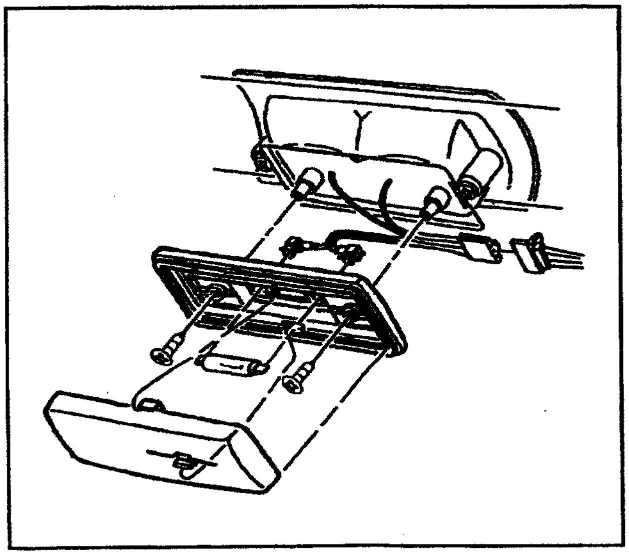


Figure 9—Dome Lamp (Pickup)

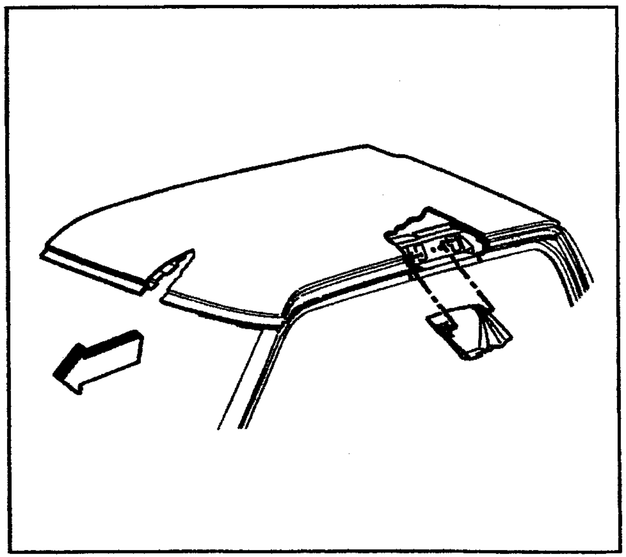


Figure 10—Rear Side Door Upper Latch Cover

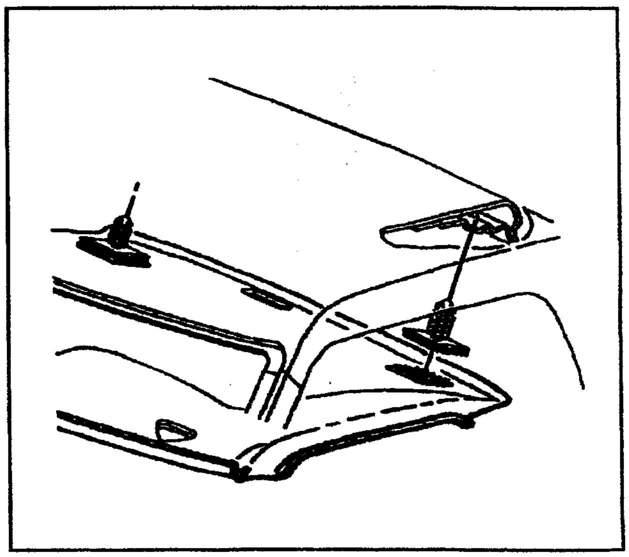


Figure 11—Headliner (Pickup)

Install or Connect (Figures 9 through 11)

- New headliners must be pierced to accommodate actual vehicle accessories.

1. Headliner to the vehicle.
2. Secure the body side trim panels at the roof line.
3. Windshield garnish moldings. Refer to Windshield Garnish Molding Replacement in this section.
4. Sunshades and retainers. Refer to Sunshade and Retainer Replacement in this section.
5. Rear side door upper latch cover, if equipped.
6. Passenger assist handle. Refer to Assist Handle Replacement in this section.
7. Coat hooks. Refer to Coat Hook Replacement in this section.
8. Dome lamp. Refer to Dome Lamp Replacement in Lighting Systems.

BODY SIDE TRIM PANEL REPLACEMENT

Standard Cab Pickup

Remove or Disconnect (Figure 12)

1. Door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.
2. Coat hook. Refer to Coat Hook Replacement in this section.
3. Upper and lower seat belt anchor bolts. Refer to Front Seat Belt in Restraints.
4. Body side trim panel from the vehicle.
   A. Electrical connectors as necessary.
   B. Shoulder belt opening trim cover.
   C. Feed the seat belt through the trim panel.

Install or Connect (Figure 12)

1. Body side trim panel to the vehicle.
   A. Feed the seat belt through the trim panel.
   B. Shoulder belt opening trim cover.
   C. Electrical connectors as necessary.
2. Upper and lower seat belt anchor bolts. Refer to Front Seat Belt in Restraints.
3. Coat hook. Refer to Coat Hook Replacement in this section.
4. Door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.

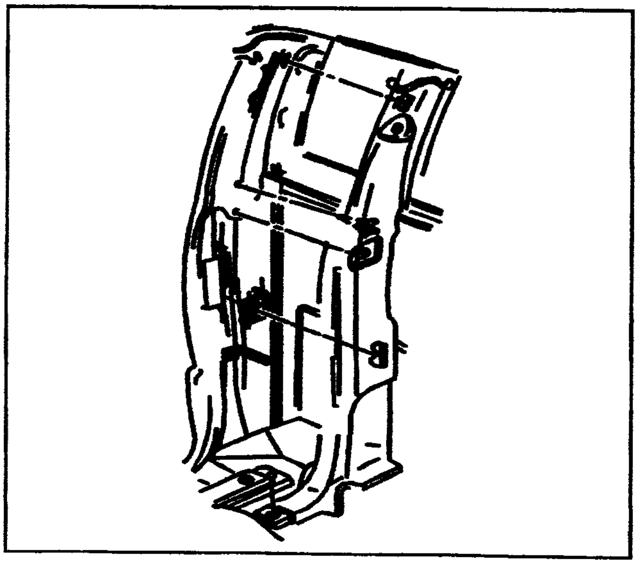


Figure 12—Body Side Trim Panel

FRONT SIDE DOOR LOCK PILLAR GARNISH MOLDING REPLACEMENT

Remove or Disconnect (Figure 13)

1. Front and rear door sill trim plates. Refer to Door Sill Trim Plate Replacement in this section.
2. Upper and lower front seat belt anchor bolts.
3. Front side door lock pillar garnish molding from the vehicle.
   - Feed the seat belt through the garnish molding.

Install or Connect (Figure 13)

1. Front side door lock pillar garnish molding to the vehicle.
   - Feed the seat belt through the garnish molding.
2. Upper and lower front seat belt anchor bolts.

Tighten

- Bolts to 70 N.m (52 lb ft).

3. Front and rear door sill trim plates. Refer to Door Sill Trim Plate Replacement in this section.

REAR WINDOW GARNISH MOLDING REPLACEMENT

Tool Required:
J 38778 Door Trim Pad and Garnish Clip Remover

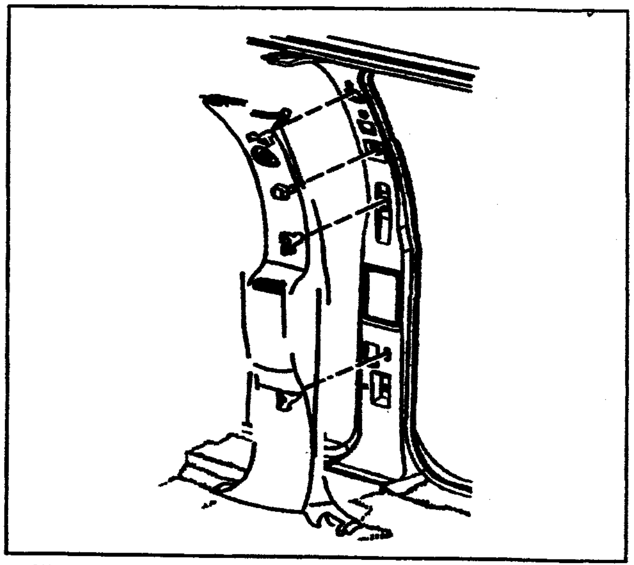


Figure 13—Front Side Door Lock Pillar Garnish Molding

Remove or Disconnect (Figure 14)

1. Rear window garnish molding using tool J 38778.
   - A. Insert tool J 38778 and work along the bottom edge of the molding from one end to the other.
   - B. Lift the molding to release tabs along the upper edge.

Install or Connect (Figure 14)

1. Rear window garnish molding to the vehicle.
   - A. Slide the molding down to engage the tabs along the upper edge.
   - B. Align the retainer clips with the slots along the bottom edge and press the molding into place.

REAR INNER PANEL CARPET REPLACEMENT

Tool Required:
J 38778 Door Trim Pad and Garnish Clip Remover

Remove or Disconnect (Figure 15)

1. Jack storage cover.
2. Rear window garnish molding. Refer to Rear Window Garnish Molding Replacement in this section.
3. Release the rear carpet panel retainers using tool J 38778.
4. Rear inner panel carpet from the vehicle.

Install or Connect (Figure 15)

1. Rear inner panel carpet to the vehicle.
2. Secure the rear inner panel carpet retainers to the body rear inner panel.
3. Rear window garnish molding. Refer to Rear Window Garnish Molding Replacement in this section.
4. Jack storage cover.

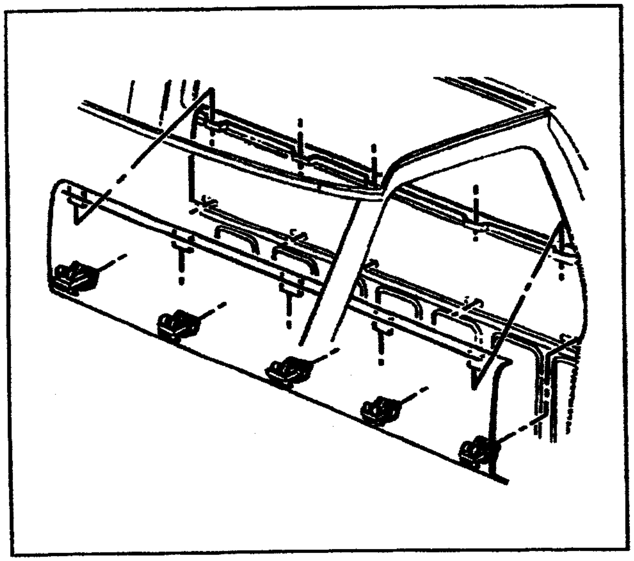


Figure 14—Rear Window Garnish Molding

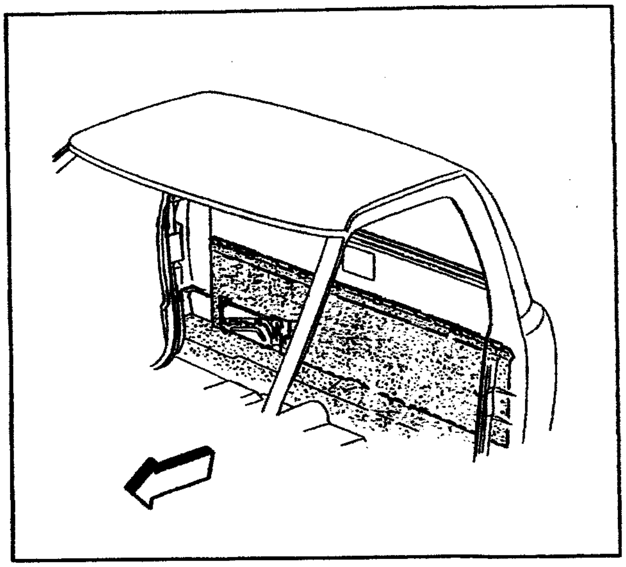


Figure 15—Rear Inner Panel Carpet

DOOR SILL TRIM PLATE REPLACEMENT

Side Doors

Tool Required:
J 38778 Door Trim Pad and Garnish Clip Remover

Remove or Disconnect (Figure 16)

1. Door sill trim plate from the vehicle using tool J 38778.

Install or Connect (Figure 16)

1. Door sill trim plate to the vehicle.
   - Align the retainers along the door sill and press into place.

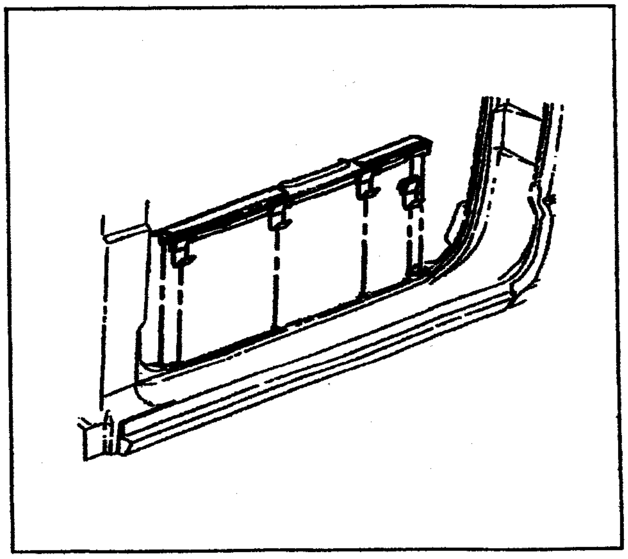


Figure 16—Door Sill Trim Plate

BODY HINGE PILLAR TRIM PANEL REPLACEMENT

Left Side

Remove or Disconnect (Figure 17)

1. Left front door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.
2. Body hinge pillar trim panel from the vehicle.

Install or Connect (Figure 17)

1. Body hinge pillar trim panel to the vehicle.
2. Left front door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.

Right Side

Remove or Disconnect (Figure 18)

1. Disable the SIR. Refer to Disabling The SIR System in Restraints.
2. Right front door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.
3. Right-side instrument panel sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
4. Body hinge pillar trim panel.
5. Screws that retain the DERM bracket to the body hinge pillar trim panel.
6. DERM from the body hinge pillar trim panel.

Install or Connect (Figure 18)

1. DERM to the body hinge pillar trim panel.
2. Screws that retain the DERM bracket to the body hinge pillar trim panel.

Tighten

- 0.5 N·m (4 lb in).

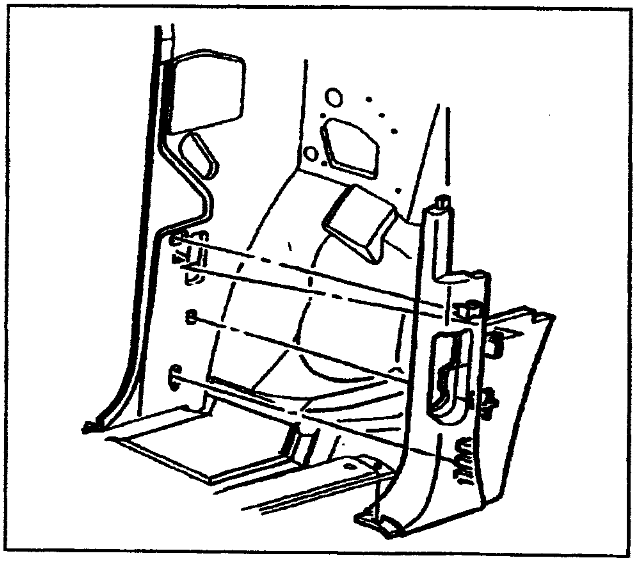


Figure 17—Left Side Body Hinge Pillar Trim Panel

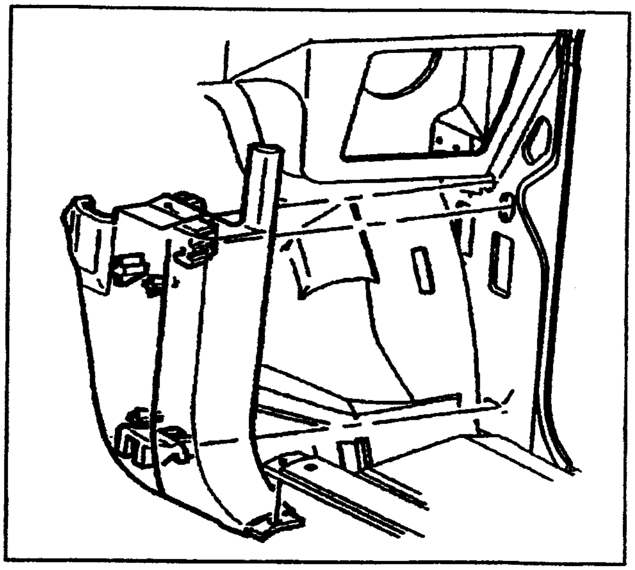


Figure 18—Right Side Body Hinge Pillar Trim Panel

3. Body hinge pillar trim panel.
4. Right-side instrument panel sound insulator. Refer to Instrument Panel Sound Insulator Replacement in this section.
5. Right front door sill trim plate. Refer to Door Sill Trim Plate Replacement in this section.
6. Enable the SIR. Refer to Disabling The SIR System in Restraints.

FLOOR MAT REPLACEMENT

Pickup

Remove or Disconnect (Figure 19)

1. Front seats. Refer to Front Seat Replacement in Seats.
2. Seat buckles from the floor. Refer to Driver Seat Buckle and Passenger Seat Buckle in Restraints.
3. Jack cover and jack from the vehicle.

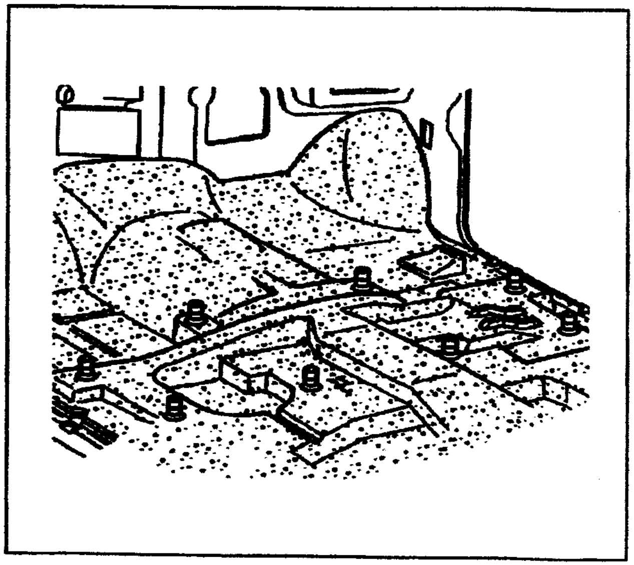


Figure 19—Front Floor Mat (Pickup)

4. Door sill trim plates. Refer to Door Sill Trim Plate Replacement in this section.
5. Floor console or cup holder, if equipped. Refer to Floor Console Replacement or Front Floor Cup Holder Replacement in this section.
6. Body side trim panels. Refer to Body Side Trim Panel Replacement in this section.
7. C-pillar trim panel, extended cab with rear side door only. Refer to C-pillar Trim Panel Replacement in this section.
8. Body hinge pillar trim panels. Refer to Body Hinge Pillar Trim Panel Replacement in this section.
9. Mat from the vehicle.

Install or Connect (Figure 19)

1. Mat to the vehicle.
2. Body hinge pillar trim panels. Refer to Body Hinge Pillar Trim Panel Replacement in this section.
3. C-pillar trim panel, extended cab with rear side door only.
4. Body side trim panels. Refer to Body Side Trim Panel Replacement in this section.
5. Floor console or cup holder, if equipped.
6. Door sill trim plates Refer to Door Sill Trim Plate Replacement in this section.
7. Jack cover and jack to the vehicle.
8. Seat buckles to the floor. Refer to Driver Seat Buckle and Passenger Seat Buckle in Restraints.
9. Front seats. Refer to Front Seat Replacement in Seats.

WINDSHIELD GARNISH MOLDING REPLACEMENT

Tool Required:
J 38778 Door Trim Pad and Garnish Clip Remover

Remove or Disconnect (Figure 20)

1. Windshield garnish molding from the windshield pillar using tool J 38778.
   - Pull the molding away from the pillar and up to remove.

Install or Connect (Figure 20)

1. Windshield garnish molding to the windshield pillar.
   - Align the retainer clips with the slots and press into place.

SUNSHADE AND RETAINER REPLACEMENT

Remove or Disconnect (Figure 21)

1. Loosen the screws that retain the sunshade to the roof.
2. Sunshade from the vehicle.
   - While pulling down on the sunshade base, push in on the extended screws.

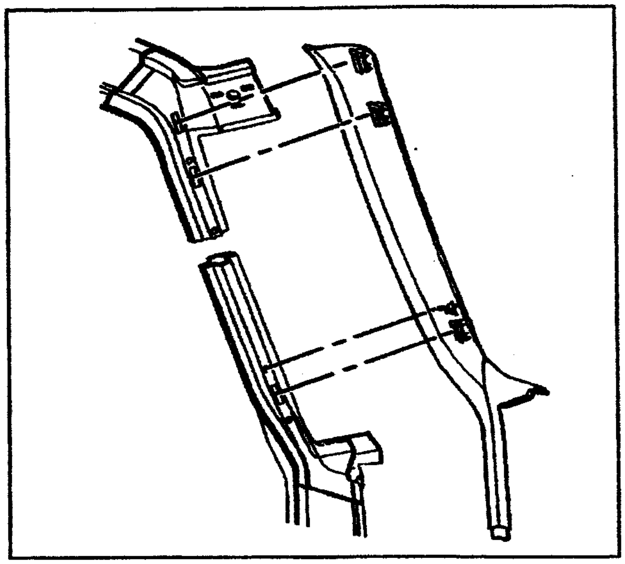


Figure 20—Windshield Garnish Molding

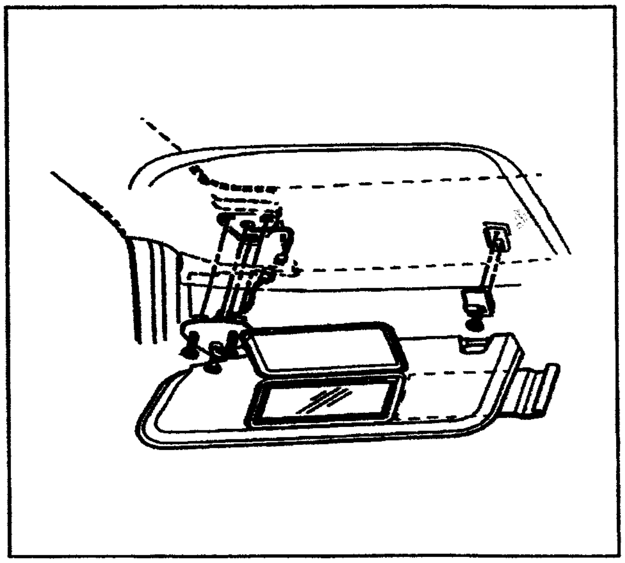


Figure 21—Sunshade and Retainer

3. Loosen the screw that retains the sunshade retainer to the roof.
4. Sunshade retainer from the vehicle.
   - While pulling down on the retainer, push in on the extended screw.

Install or Connect (Figure 21)

1. Sunshade retainer to the roof.

   Tighten

   - Sunshade retainer screw to 1.1 N.m (10 lb in).

2. Sunshade to the roof.

   Tighten

   - Sunshade screws to 1.1 N.m (10 lb in).

ASSIST HANDLE REPLACEMENT

Remove or Disconnect (Figure 22)

1. Assist handle covers.
   - The assist handle covers are easily damaged by prying.
   - Carefully insert a flat-blade tool between the cover and the handle to remove.
2. Screws that retain the assist handle to the vehicle.
3. Assist handle from the vehicle.

Install or Connect (Figure 22)

1. Assist handle to the vehicle.
2. Screws that retain the assist handle to the vehicle.

Tighten

   - Screws to 9 N·m (80 lb in).
3. Assist handle covers.
   - Position the covers and snap them into place.

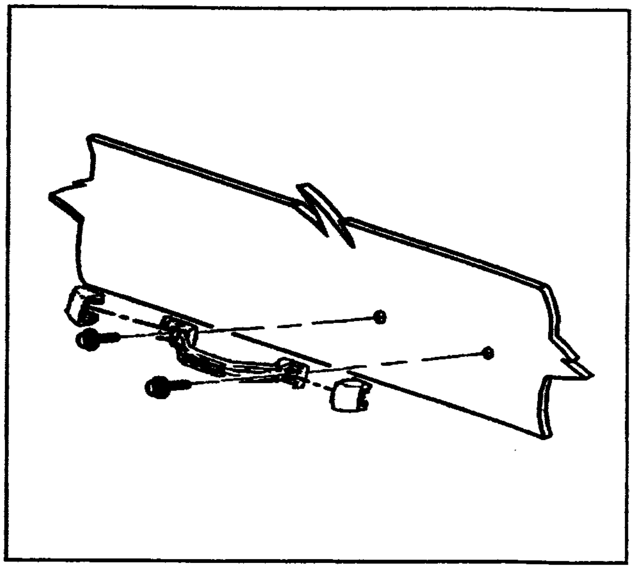


Figure 22—Assist Handle

COAT HOOK REPLACEMENT

Remove or Disconnect (Figure 23)

1. Screw that retains the coat hook to the vehicle.
2. Coat hook from the vehicle.

Install or Connect (Figure 23)

1. Coat hook to the vehicle.
2. Screw that retains the coat hook to the vehicle.

Tighten

   - Screw to 1.9 N·m (17 lb in).

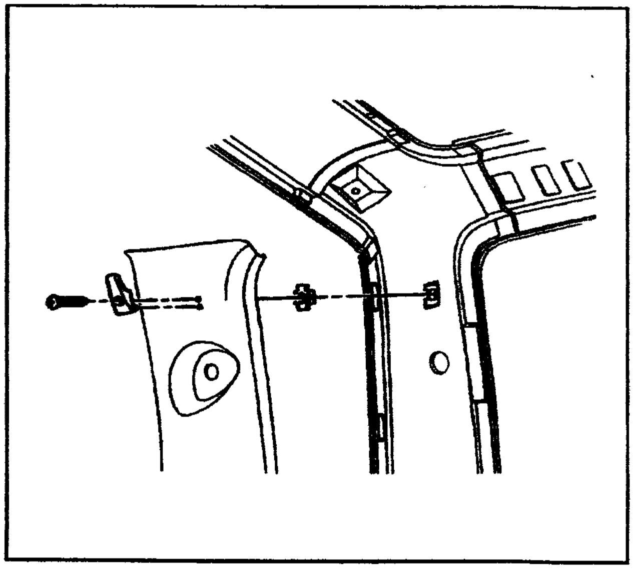


Figure 23—Coat Hook

FLEXIBLE PLASTIC PART REFINISHING

NOTICE: ***Use supplies, primers, basecoats and clearcoats from the same manufacturer for the best results. Do not intermix paint systems.***

To refinish repaired or replacement interior parts, follow the paint manufacturer's directions regarding preparation, priming, and refinishing. Because these parts are flexible, they may require special additives in the primers and topcoat to prevent cracking and poor adhesion. Always use the manufacturer's recommended materials. Never intermix with other paint systems.

To identify the type of paint to use when refinishing interior panels, refer to Service Parts Identification (SPID) Label in General Information. This label contains all paint technology information, paint codes, trim level, and any special order paint color codes necessary to identify the correct paint.

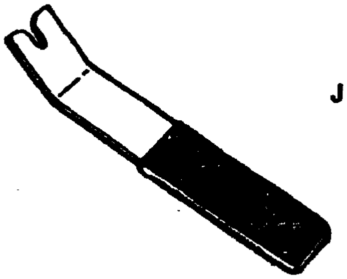
SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N.m	Lb ft	Lb in
Instrument Compartment Bezel Screws	1.9	—	17
Instrument Compartment Door Striker Screws	1.9	—	17
Passenger Inflatable Restraint Module Screws	1.9	—	17
Instrument Compartment Door Hinge Screws	1.9	—	17
Left Side Instrument Panel Sound Insulator to Accelerator Bracket Nut	4	—	35
Instrument Panel Sound Insulator to Cowl Panel Screws	1.9	—	17
Instrument Panel Sound Insulator to Knee Bolster Screws	1.9	—	17
DLC Screws	2.4	—	21
Instrument Panel Sound Insulator to Floor Duct Screw	1.9	—	17
Instrument Panel Sound Insulator to Heater Assembly Screw	1.5	—	13
Instrument Panel Sound Insulator to Instrument Panel Screws	1.9	—	17
Knee Bolster Screws (Torx® Head)	9	—	80
Knee Bolster Screws (Hex Head)	1.9	—	17
Knee Bolster Bracket Bolts (Hex Head)	6.3	—	56
Knee Bolster Bracket Nuts (Hex Head)	10	—	89
Knee Deflector Nuts	10	—	89
Courtesy Lamp Screws	1.9	—	17
Coat Hook Screws	1.9	—	17
Instrument Panel Accessory Trim Plate Screws	1.9	—	17
Steering Column Mounting Nuts	30	22	—
Speaker Grille Screws	1.9	—	17
Radio Screws	1.9	—	17
HVAC Control Assembly Screws	1.9	—	17
Seat Belt Anchor Bolts	70	52	—
Body Side Trim Panel Screws	1.9	—	17
Rear Seat Belt Lower Anchor Nuts	80	59	—
DERM Bracket Screws	0.5	—	4
Cargo Tiedown Hook Bolts	35	26	—
Sunshade Retainer Screws	1.1	—	10
Sunshade Screws	1.1	—	10
Assist Handle Screws	9	—	80
Coat Hook Screws	1.9	—	17

SPECIAL TOOLS

1.



J 38778

1. DOOR TRIM PAD AND GARNISH CLIP REMOVER

2910r5280

SECTION 10A5

FRAME AND BUMPERS

GENERAL DESCRIPTION

Proper frame alignment is critical to ensure normal life and function of many parts on the vehicle. If the vehicle has been involved in a fire, collision, or has been overloaded, check the frame alignment. If for any other reason alignment is suspected, it should be checked. Refer to Checking Frame Alignment in this section.

It is possible that certain conditions make the frame appear to be out of alignment when, in fact, it is not. Refer to Checking Frame Alignment, in this section for descriptions of these conditions.

Terms used in this section are briefly defined below:

1. **SECTION MODULUS** is a measure of the strength of a frame based on height, width, thickness, and shape of the side rails. It does not account for the strength of the material used in the frame.
2. **YIELD STRENGTH** is a measure of the strength of the material from which the frame is made. It is the maximum load that can be placed on a material and still have it return to its original shape. It is measured in kPa (psi).
3. **RESISTANCE TO BENDING MOMENT (RBM)** is a single measure of frame strength that accounts for both section modulus and the strength of the material used.
4. **COLLAPSE** refers to the condition that occurs when buckles appear on more than one surface of the box section of the side rail, or when a section of the underbody or frame structure has been shortened in length (Figure 1).
5. **DIAMOND** refers to the condition where one side of the frame has been moved forward or rear causing the frame structure to be out of square (Figure 2).
6. **SAG** refers to a vertical misalignment resulting in an incorrect datum line. When both sides are equally misaligned, this condition is known as kick-up (Figure 3).

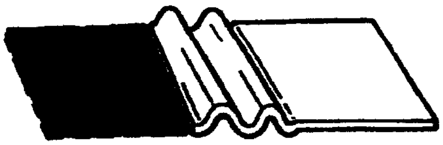


Figure 1—Collapse (Damage Condition)

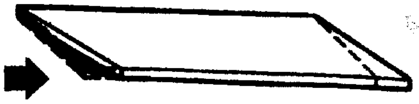


Figure 2—Diamond (Damage Condition)

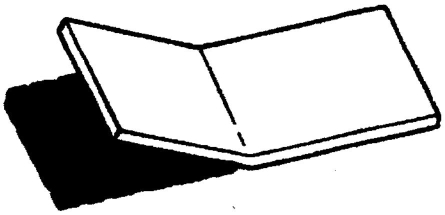


Figure 3—Sag (Damage Condition)

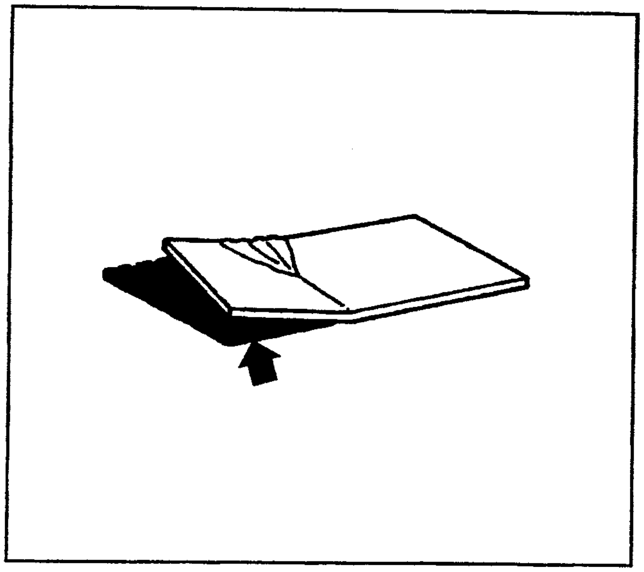


Figure 4—Sidesways (Damage Condition)

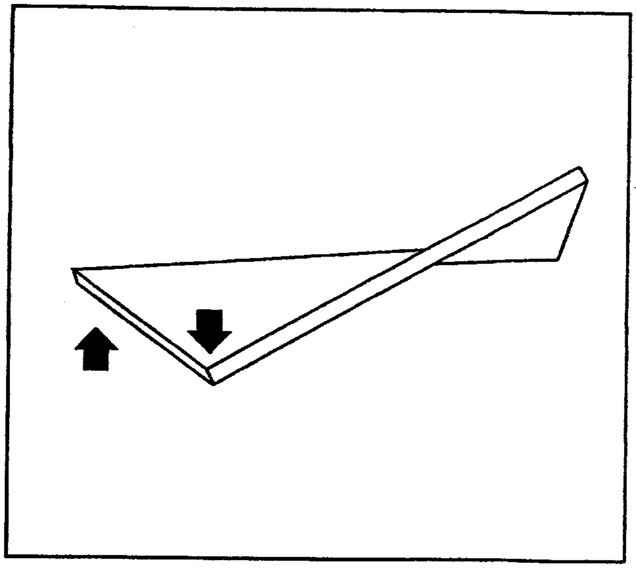


Figure 5—Twist (Damage Condition)

7. **SIDESWAY** refers to a section of the frame that is positioned to the left or right of centerline, when compared to the rest of vehicle (Figure 4).
8. **TRACKING** refers to the alignment of the vehicle axles with each other. A misaligned frame can cause improper tracking. If the vehicle is tracking correctly, all axles will be parallel to each other and perpendicular to the centerline of frame.
9. **TWIST** refers to the condition where the sides of the underbody plane (datum) are not parallel. One rail will slope up while the other rail will slope down (Figure 5).
10. **WEB** refers to the vertical part of a channel-type frame rail.
11. **DATUM** refers to the plane of the underbody of frame from which all vertical measurements originate.
12. **TRAM LENGTH** refers to measurements that are two-dimensional and parallel to the datum line.

DIAGNOSIS OF THE FRAME

PROBLEM	POSSIBLE CAUSE	CORRECTION
Sag	1. Loads greater than the frame is designed to carry. 2. Uneven load distribution. 3. Abrupt changes in section modulus. 4. Improper body, or accessory, mounting: — Holes drilled in the flange of the frame rail. — Too many holes in the web section of the rail. — Holes in the web section which are too close to each other. — Four or more holes in the same vertical line of the rail web. — Welds on the flange, particularly across the flange or along its edge. — Cutting holes in the rail with a torch. — Cutting notches anywhere on the rails. 5. A fire involving the vehicle. 6. A collision involving the vehicle. 7. The use of equipment for which the frame has not been designed or reinforced.	1-7. Straighten and reinforce the frame. See Straightening Frames.

CHECKING FRAME ALIGNMENT

The main components of a frame are the side rails and crossmembers. The rails carry the load and the crossmembers stabilize the rails.

Types of body misalignment can be divided into the following five groups:

- sag
- collapse
- diamond
- sidesway
- twist

A misaligned frame rail may have moved forward from, up or down from, or to the side of where it should be. These possibilities must be checked.

The easiest way to check body alignment is with tramming gauges and universal measuring systems made for this purpose. Detailed instructions are normally supplied with the equipment at the time of purchase. Therefore, instructions for equipment usage are not given in this manual.

Whether alignment is checked with or without gauges, the vehicle must be parked on a level section of floor.

Certain conditions call for preliminary checks before actually checking the frame. Suspension or axle problems may make it appear that the vehicle frame is out of alignment. If an axle has shifted, a Diamond or Sidesway may appear to exist when, in fact, they do not. A weak spring may make the vehicle appear to have a twisted frame.

A visual inspection of the top and bottom flanges of each rail may reveal the specific area where sag or buckle exists. In the case of sag, wrinkles may appear on the top of the upper flange. Wrinkles on the bottom of the lower flange are definite evidence of buckle.

BODY MEASUREMENTS

To determine the extent of damage to the structure of a vehicle it is important to know how and where to measure the vehicle.

Refer to the dimension chart below that applies to vehicle model for body measurement specifications. Dimension tolerances are within ± 3mm.

Reference Points

Reference points are locations on a vehicle which correspond to specific measuring points. Reference points can be used when checking the vehicle structure.

Dimension charts use the center of a hole, center of a bolt head or nut, etc. as a reference point. A description and location chart will tell you how and where the measurements should be taken. The most accurate reference point is a gauge hole or a control hole used by the assembly plant to control tolerances when the vehicle was built.

Control Holes

Control holes (Figure 6) are round or oval holes located in the underbody frame structure sections (upper body and body sides). Some control holes can be identified from other holes by a turned up lip on the inside of the hole. This reinforced lip reduces the possibility of hole distortion and increases accuracy during assembly. When measuring underbody dimensions, utilize control points whenever possible to get accurate readings.

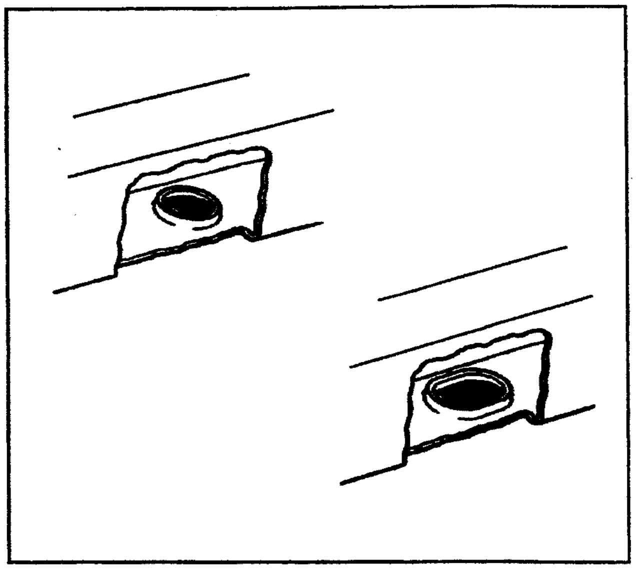


Figure 6—Typical Control Holes

Symmetrical Reference Points

Symmetrical reference points are two corresponding points on opposite sides of the centerline that have equal specifications in length, width, and height. Symmetrical reference points are used to make quick checks to determine underbody structural damage.

All measurements provided in the dimension charts below are symmetrical unless otherwise noted.

Asymmetrical Reference Points

When two corresponding reference points have different measurements they are asymmetrical. If you perform a quick cross check and the measurements are unequal, you should check the dimension charts to find out if the measuring points are symmetrical or asymmetrical.

Datum Plane

A datum (Figure 7) is an imaginary horizontal plane that runs below and parallel to the vehicle. Height dimensions are calculated at right angles from, the

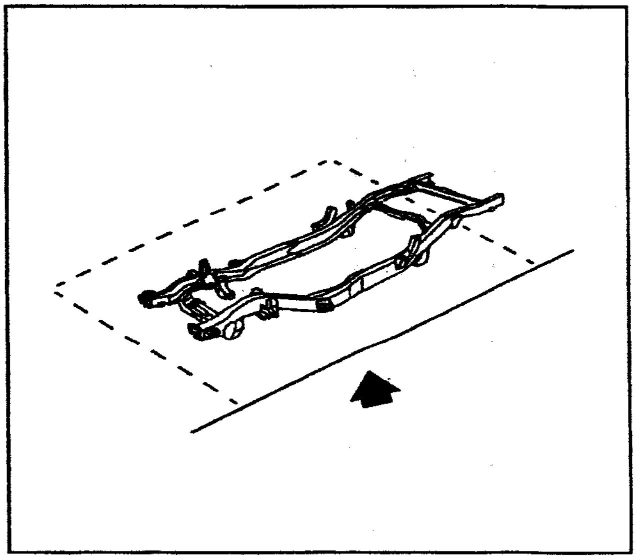


Figure 7—Datum Plane

DIAGNOSIS OF THE FRAME (cont'd)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Buckle	1. Using equipment such as snow plows for which the frame was not designed. 2. A collision involving the vehicle. 3. A fire involving the vehicle. 4. In addition to these causes, refer to possible causes 3 and 4 under Sag.	1-4. Straighten and reinforce the frame. See Straightening Frames.
Sidesway	1. A collision involving the vehicle. 2. A fire involving the vehicle. 3. The use of equipment such as snow plows for which the frame was neither designed nor properly reinforced. 4. In addition to these causes, refer to possible causes 3 and 4 under Sag.	1-4. Straighten and reinforce the frame. See Straightening Frames.
Diamond	1. A collision involving the vehicle. 2. Towing another vehicle with a chain attached to one corner of the frame.	1-2. Straighten and reinforce the frame. See Straightening Frames.
Twist	1. An accident or collision involving the vehicle. 2. Operating the vehicle in very rough terrain.	1-2. Straighten and reinforce the frame. See Straightening Frames.
Improper Tracking	1. Frame is out of alignment. 2. Front or rear axle has shifted. 3. Incorrect wheel alignment.	1. Replace or weld and reinforce rail. Ream bolt holes and replace with larger bolts if necessary. Retighten bolts. 2. Replace or weld and reinforce the rai[illegible] See the appropriate heading, later i[illegible] this section. 3. Refer to Front Wheel Alignment.
Cracks in Web of Rails	1. Loose crossmember attaching bolts. 2. Concentration of stress that may result from many different factors. (See Sag under Diagnosis previously described in this chart. Also see Minimizing Frame Damage and Reinforcements (later in this section).	1. Replace or weld and reinforce rail. Ream bolt holes and replace with larger bolts if necessary. Retighten bolts. 2. Replace or weld and reinforce rail as explained later in this section.

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MINIMIZING FRAME SERVICE

Generally, frame service can be minimized or eliminated by minimizing the concentration of stress in small areas of the frame.

1. Vehicles should be used only for those purposes for which they were designed.
   - Do not overload.
   - Load evenly; localized loads should be avoided.
   - Do not operate the vehicle on extremely rough terrain.
   - Take into account the forces that will be placed on a frame from the operation of equipment (such as snow plows) when picking a frame for a new vehicle or reinforcing a frame.
2. Follow recommended practices when repairing a frame or mounting a body or equipment on a frame.
   - Avoid sudden changes in the section modulus.
   - Do not drill holes in the frame rail flanges.
   - Space holes in the web section of a rail at least 13 mm (0.5 in) from one another.
   - Use existing holes whenever possible.
   - Do not cut holes with a torch.
   - Do not overheat the frame rails.
   - Avoid welding on the flanges.
   - Do not allow four or more holes to exist on the same vertical line of the web.

datum to a given control or reference point on the underbody.

The company that develops height dimensions determines the location of the datum based on the equipment being used. Therefore, different datum lines are established for the same vehicle. You can add or subtract an equal amount from all height dimensions and create a new datum line for your usage.

Center Plane

A centerline (Figure 8) is an imaginary vertical plane that is perpendicular to the length of the datum plane through the center of the vehicle. The centerline is any line drawn through the center of the vehicle's datum. The symbol for centerline is CL.

Centerline Length

Centerline length measurements are three dimensional measurements. These three dimensions are:

- Length (distance between two points when height is parallel to center plane).
- Height (measurement is parallel to datum plane).
- Width (measurement is parallel to center plane).

When reading dimension charts, horizontal width and length dimensions of the underbody are shown as viewed from the bottom of the underbody. Vertical dimensions are shown from the side of the underbody and use the datum plane as a base for all vertical (height) measurements.

Vertical Body Zero Line

The vertical body zero line (Figure 9) is a line drawn through the frame either at the forward or rearward torque box area of the frame. This is the starting point for determining length measurements.

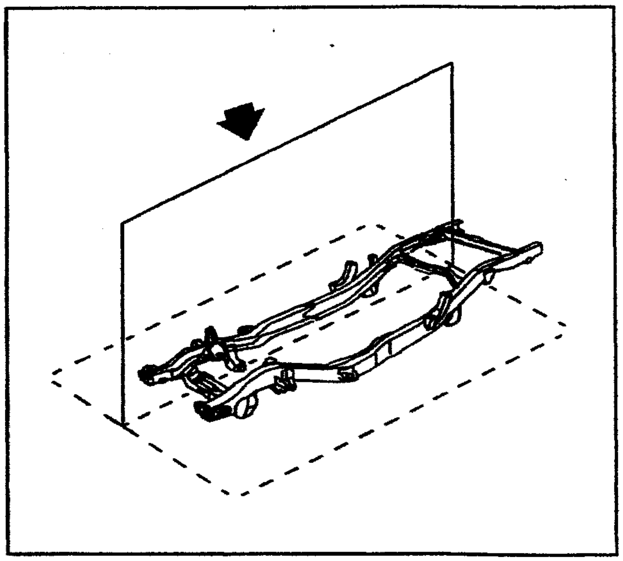


Figure 8—Centerline Plane

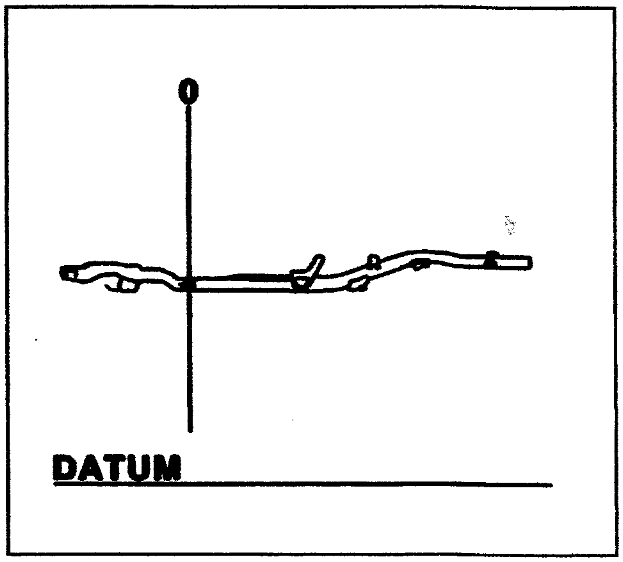
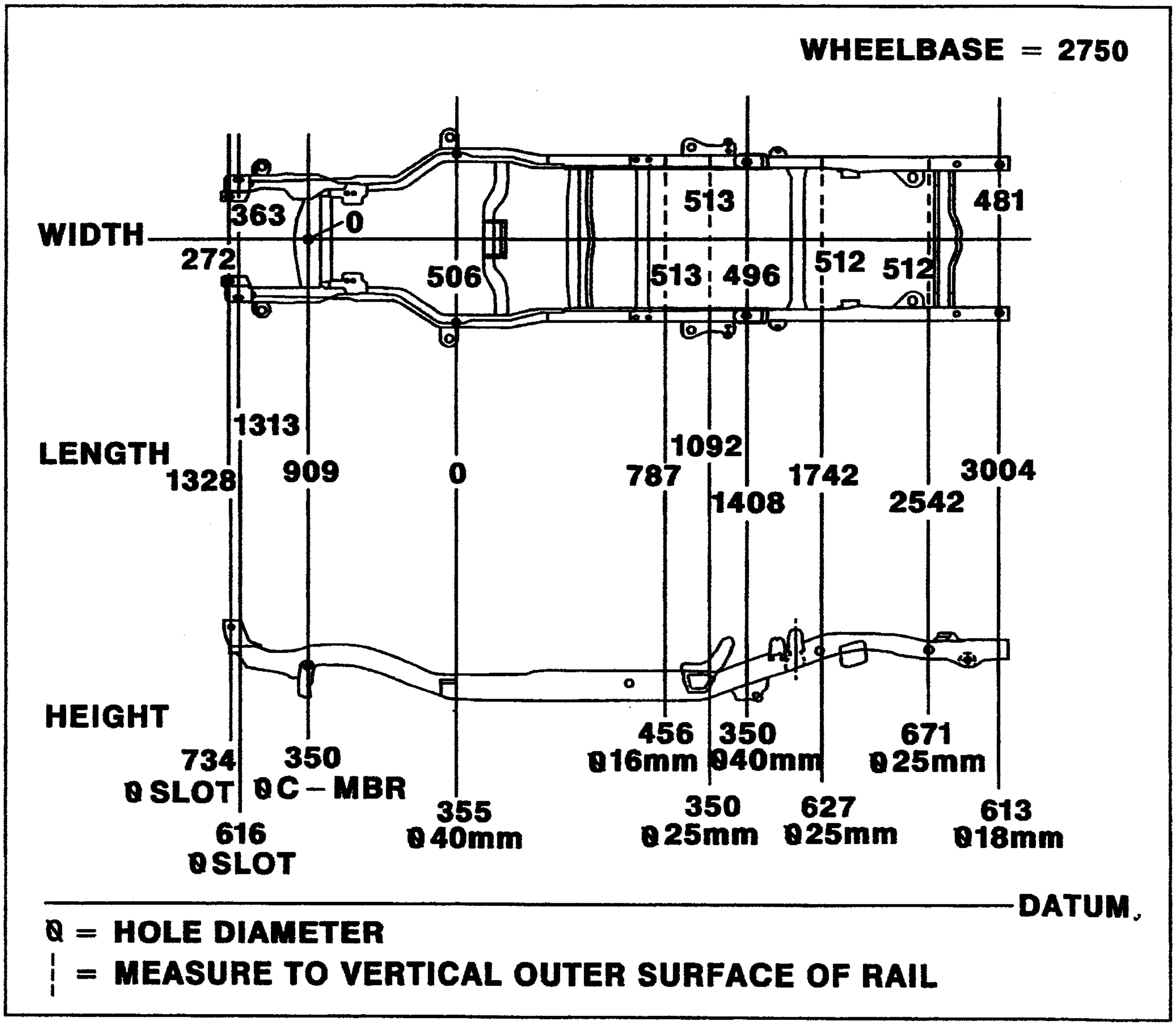
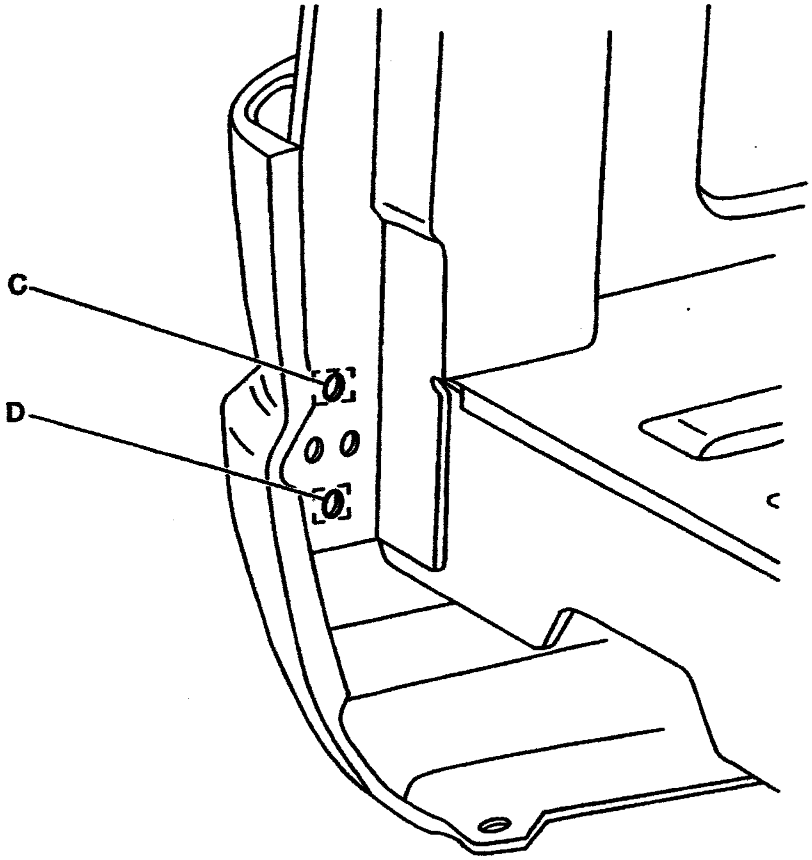


Figure 9—Vertical Body Zero Line

FRAME DIMENSIONS—PICKUP, REGULAR CAB, SHORT BED


WHEELBASE = 2750
WIDTH
363
0
272
506
513
513
496
512
512
481
LENGTH
1313
1328
909
0
1092
787
1408
1742
2542
3004
HEIGHT
734
Ø SLOT
616
Ø SLOT
350
Ø C–MBR
355
Ø 40mm
456
Ø 16mm
350
Ø 40mm
350
Ø 25mm
627
Ø 25mm
671
Ø 25mm
613
Ø 18mm
DATUM
Ø = HOLE DIAMETER
¦ = MEASURE TO VERTICAL OUTER SURFACE OF RAIL

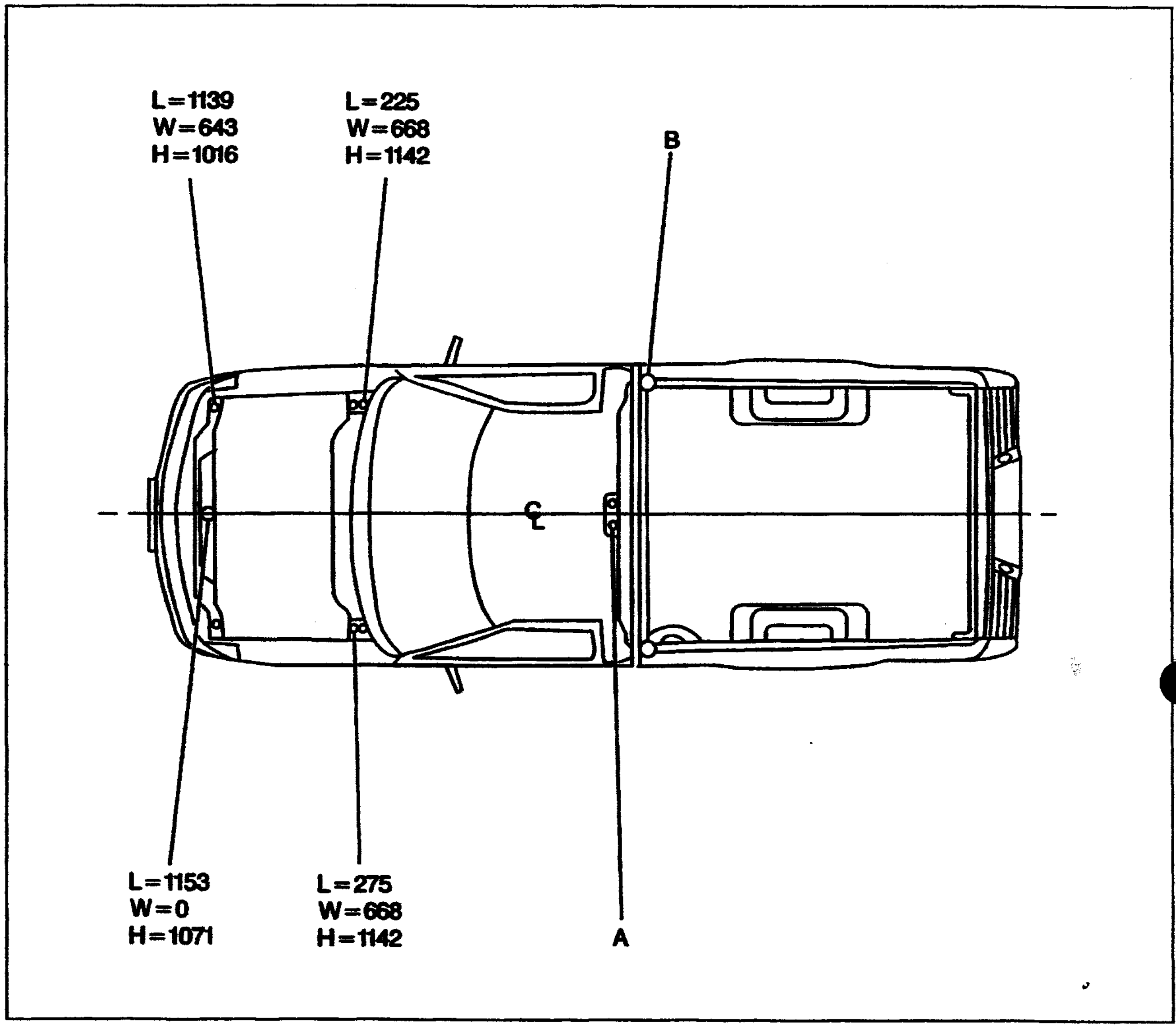
PICKUP BODY DIMENSIONS—ENDGATE HINGE



DESCRIPTION—PICKUP TAILGATE HINGE

Reference Points	L	W	H	Location
C	3117	712	782	Upper Tailgate Hinge Mount (Regular Cab)
D	3117	712	716	Lower Tailgate Hinge Mount (Regular Cab)

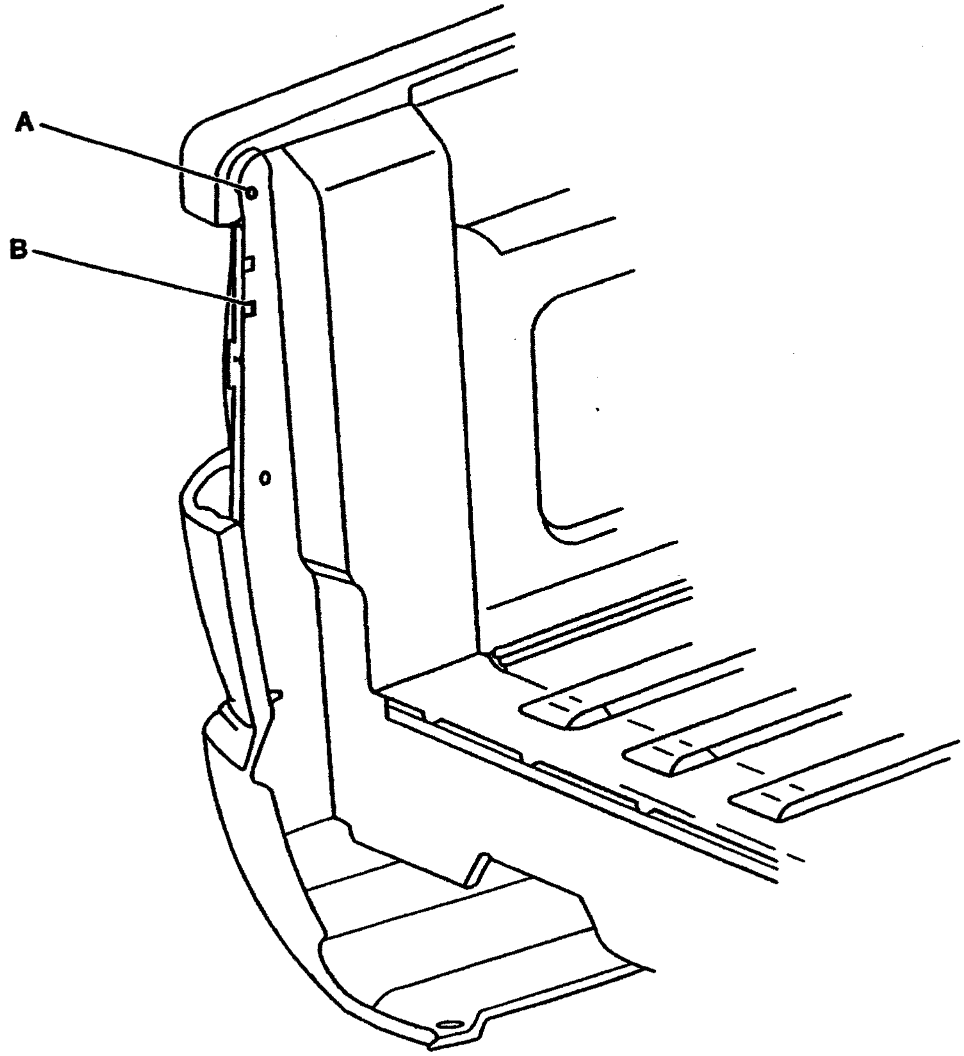
PICKUP BODY DIMENSIONS—TOP VIEW


L=1139
W=643
H=1016
L=225
W=668
H=1142
B
L=1153
W=0
H=1071
L=275
W=668
H=1142
A

DESCRIPTION—PICKUP TOP VIEW

Reference Points	L	W	H	Location
A	1058	65	1660	CHMSL Mounting Hole Regular Cab
B	1261	723	1221	Inboard Edge of Bed at Joint Regular Cab
*CHMSL = Center High-Mounted Stop Lamp				

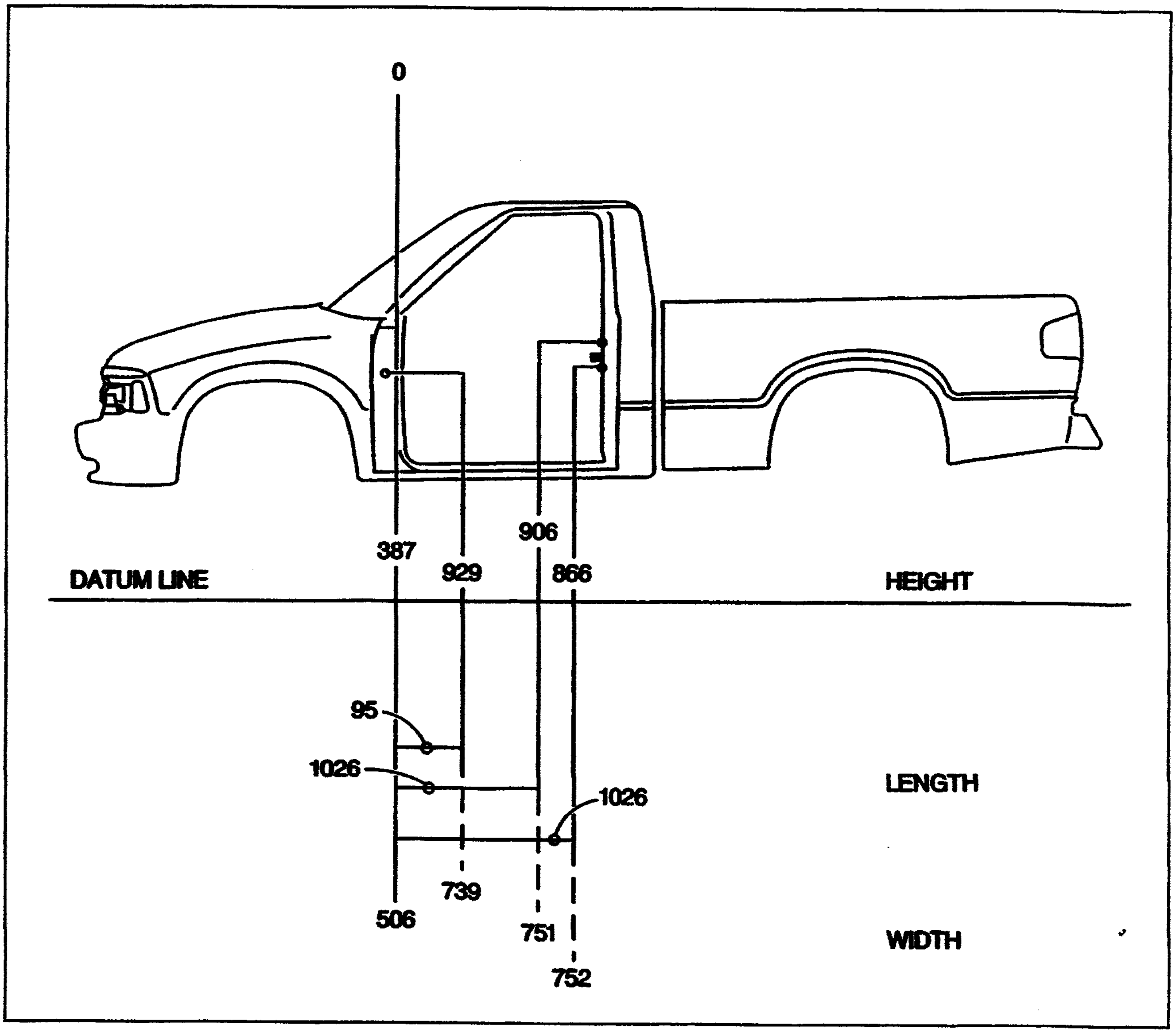
PICKUP BODY DIMENSIONS—ENDGATE STRIKER/LATCH



DESCRIPTION—PICKUP TAILGATE STRIKER/LATCH

Reference Points	L	W	H	Location
A	3116	701	1165	Upper Tailgate Hinge Mount (Regular Cab)
B	3115	712	1078	Lower Tailgate Hinge Mount (Regular Cab)

PICKUP BODY DIMENSIONS—DOOR RING CONDUIT TO STRIKER (REGULAR CAB)


0
387
929
906
866
DATUM LINE
HEIGHT
95
1026
1026
LENGTH
739
506
751
752
WIDTH

DESCRIPTION — PICK-UP SIDE VIEW			
Location	L	W	H
Vertical Body Zero Line	0	387	506
Conduit Hole	95	739	929
Upper Striker Mounting Hole	1026	751	906
Lower Striker Mounting Hole	1026	752	866
			T3281

STRAIGHTENING BODY

Body straightening can be complicated and usually requires special equipment. It should be attempted by trained technicians only.

Make a complete analysis of the condition before taking any steps to straighten it. Analyzing the cause of failure will help determine the correct sequence of steps in the repair. Use corrective procedures to reverse the flow of the damaging forces. In many instances, to reverse the flow of forces, pressure must be applied from different directions at the same time.

Careful use of controlled heat is critical. Too much, too little, or the improper application of heat is a major source of trouble. Heat the area that will be stretched as the frame is straightened. Heat the area AFTER SUFFICIENT PRESSURE HAS BEEN EXERTED to cause a slight checking or silvery cracks to appear on the surface of the metal. Gradually increase the pressure while heating. Do not heat beyond 606°C (1200°F). A red glow indicates that the material is overheated. Overheating will cause distortion and stretching, as well as a change in the characteristics of the metal.

REPAIRING CRACKS

Two common types of cracks are shown in Figure 10. Straight cracks will normally start from the edge of a flange. It will travel across the flange and through the web section of a rail. Finally, it will continue through the other flange. Straight cracks result from high concentrations of stress in small areas of the frame, excessive bending movement, and torsional loading.

Sunburst crack(s) will radiate from a hole in the web section of a rail or crossmember. They are caused by high loads being applied at a mounting bracket or crossmember that is not securely attached to the rail.

p0 If cracks occur to both the rail and reinforcement at a particular area of the frame, they must be repaired separately. The flanges must react independently to prevent localized stress concentration. Use a copper spacer between the flanges of cracked base rail flanges and reinforcement flanges.

Crossmember mounting flange cracks may be repaired in the same manner as side rail cracks. However, weld bead should be built up to provide a good smooth radius. If a crossmember is badly damaged, replace it.

It may be necessary to align the frame and level the rails before repairing the frame.

1. Remove any equipment that will interfere with access to the crack.
2. Locate the extreme end of the crack and drill a 6 mm (0.25 in) hole.
3. "V" grind the entire length of the crack from the starting point to the 6 mm (0.25 in) hole at the extreme end.
4. The bottom of the crack should be opened up 2 mm (0.06 in) to allow good penetration of the weld. (A hacksaw blade may be used for this.)
5. Weld with proper electrode and welding techniques.
6. Grind the weld smooth on the inside and outside of the rail or crossmember. Be extremely careful to eliminate weld buildup or notches on the edge of the flange.

WELDING

Using improper welding techniques causes many weld and/or frame failures. The following information points out potential areas of difficulty and provides some general guidelines for successful frame welding.

Most weld failures occur at the end of the weld in areas of the frame that are under high stress. By eliminating the end of a weld, failures can be reduced. This can be done by making a hole or slot in the part to be attached and then using a fillet, weld around a slot or plug weld. Do not leave a notch at the end of a weld.

Overwelding can be harmful, especially if it is in an area of the frame that receives high concentrations of stress.

Small cracks in a crossmember may be welded.

When Welding:

1. The frame is covered with a protective wax coating. Use a wire brush to remove any concentration of wax before welding. When finished, recoat the area with new wax.
2. Do not use oxyacetylene welding equipment.
3. Whenever possible, use smaller diameter electrodes and make several passes. This is preferred to using a large diameter electrode and making fewer passes.
4. Do not use more heat than is necessary to give good penetration.
5. Make sure the weld is free from craters and undercuts.
6. Make sure scale is removed from each successive pass.
7. If repairing a crack, grind the surface of the weld flush with the parent material.
8. When mounting accessories, do not weld across the flanges.
9. When mounting accessories, do not weld within 19 mm (0.75 in) of a flange.
10. Do not weld up to the edge of a part being welded to a frame. Leave 6 mm (0.25 in) between the end of the weld and the edge of the part.
11. Do not weld cast brackets to the frame.

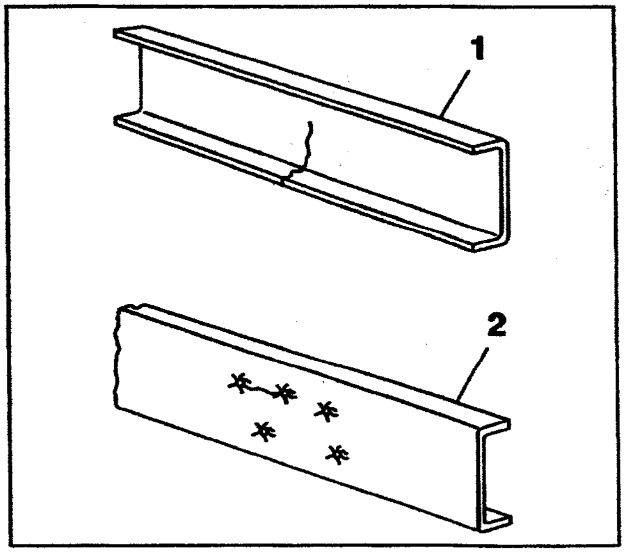


Figure 10—Types of Frame Cracks

12. Do not weld the flanges of cracked reinforcements and base rails together.
13. Do not attach the ground cable to the engine. Connect the welding machine ground cables as close to the working area as possible.
14. Disconnect the vehicle battery.
15. Do not get the welding cables near the vehicle wiring. Avoid direct contact between the welding cables and any part of the vehicle.

ON-VEHICLE SERVICE

FRONT LICENSE PLATE BRACKET REPLACEMENT

Remove or Disconnect (Figure 11)

1. Remove the bracket to front bumper screws.
2. Remove the bracket from the front bumper.

Install or Connect (Figure 11)

1. Install the bracket to the front bumper.
2. Install the bracket to front bumper screws.

Tighten

- Tighten the license plate bracket-to-front bumper screws to 7 N.m (62 lb in).

FRONT BUMPER EXTENSION REPLACEMENT

Remove or Disconnect (Figure 12)

1. Remove the front bumper extension-to-air deflector bolts.
2. Remove the front bumper extension-to-bumper nuts.
3. Remove the front bumper extension from the vehicle.
   - Slide the end cap forward to release from the fender stud.

Install or Connect

1. Install the front bumper extension to the vehicle.
2. Install the front bumper extension-to-bumper nuts.

Tighten

- Tighten the front bumper extension-to-bumper nuts until they are driven and fully seated.

3. Install the front bumper extension-to-air deflector bolts.

Tighten

- Tighten the front bumper end caps to air deflector to 7 N.m (62 Lb In).

FRONT BUMPER IMPACT BAR REPLACEMENT

Remove or Disconnect (Figure 13)

1. Remove the air deflector. Refer to Front Air Deflector Replacement in this section.
2. Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement in this section.
3. Remove the radiator grille. Refer to Sheet Metal.
4. Remove the brace-to-bumper impact bar nut and bolt.
5. Disconnect the parking lamp connectors. Refer to Lighting Systems.

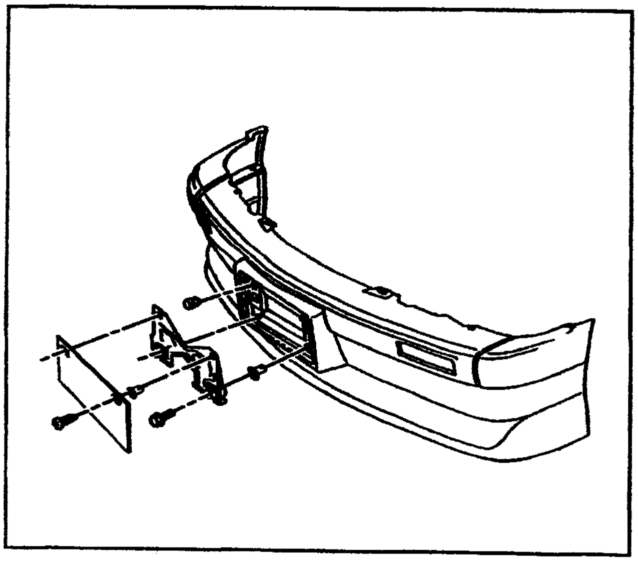


Figure 11—Front License Plate Bracket

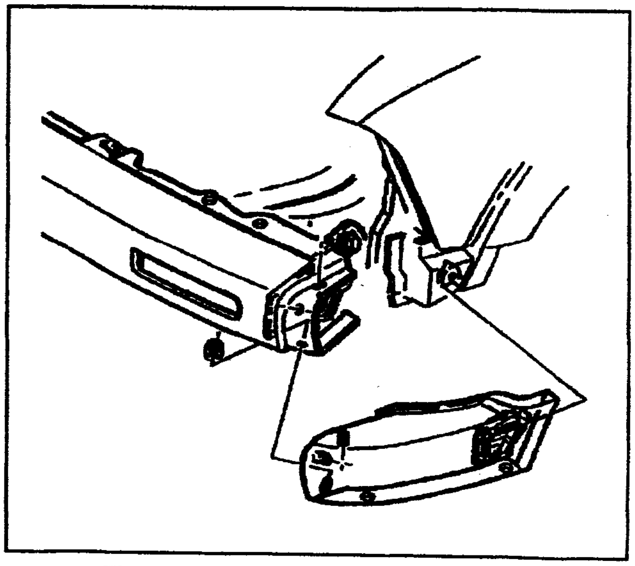


Figure 12—Front Bumper Extension

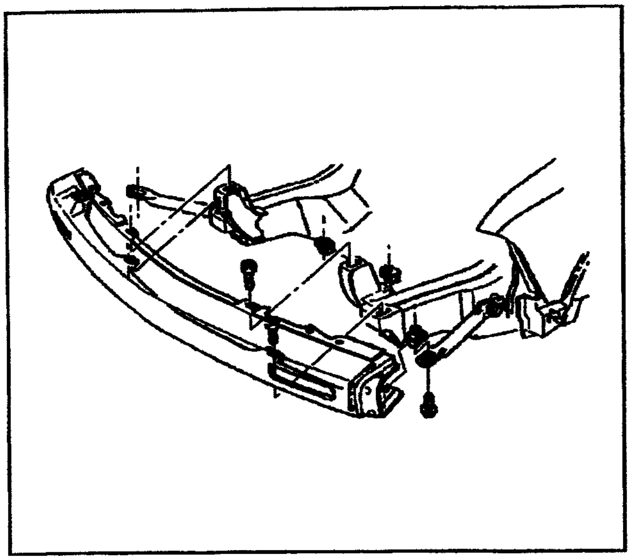


Figure 13—Front Bumper Impact Bar

6. Remove the bumper impact bar-to-frame nuts and bolts.
7. Remove the bumper impact bar from the vehicle.
8. Remove the end cap from the bumper, if equipped.

Install or Connect (Figure 13)

1. Install the side extensions to the bumper impact bar (if equipped). Refer to Front Bumper Extension Replacement, in this section.
2. Install the bumper impact bar to the vehicle.
3. Install the bumper impact bar-to-frame bolts and nuts.

Tighten

- Tighten the bumper impact bar-to-frame bolts to 40 N.m (30 lb ft).

4. Connect the parking lamp connectors. Refer to Lighting Systems.
5. Install the bumper impact bar nuts and bolts to brace.

Tighten

- Tighten the bumper impact bar to the brace bolts to 40 N.m (30 lb ft).

6. Install the radiator grille. Refer to Sheet Metal.
7. Install the front bumper fascia. Refer to Front Bumper Fascia Replacement in this section.
8. Install the air deflector. Refer to Front Air Deflector Replacement in this section.

FRONT BUMPER BRACE REPLACEMENT

Remove or Disconnect (Figure 14)

1. Remove the brace-to-impact bar nut and bolt.
2. Remove the brace-to-frame nut and bolt.
3. Remove the brace from the vehicle.

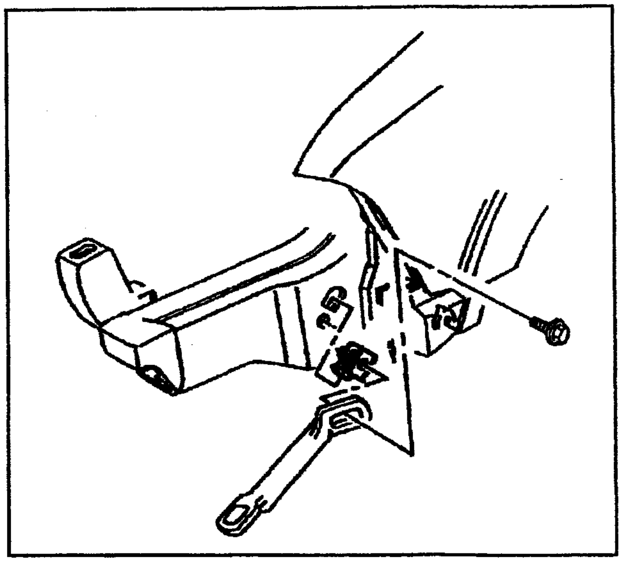


Figure 14—Front Bumper Brace

Install or Connect (Figure 14)

1. Connect the brace to the vehicle.
2. Connect the brace-to-frame nut and bolt.
3. Connect the brace-to-impact bar nut and bolt.

Tighten

- Tighten the front bumper brace mounting bolts to 40 N.m (30 lb ft).

FRONT BUMPER FASCIA REPLACEMENT

Remove or Disconnect (Figure 15)

1. Remove the high-voltage disconnect. Refer to Battery Pack Controls.
2. Remove the grille. Refer to Grille Replacement in this section.

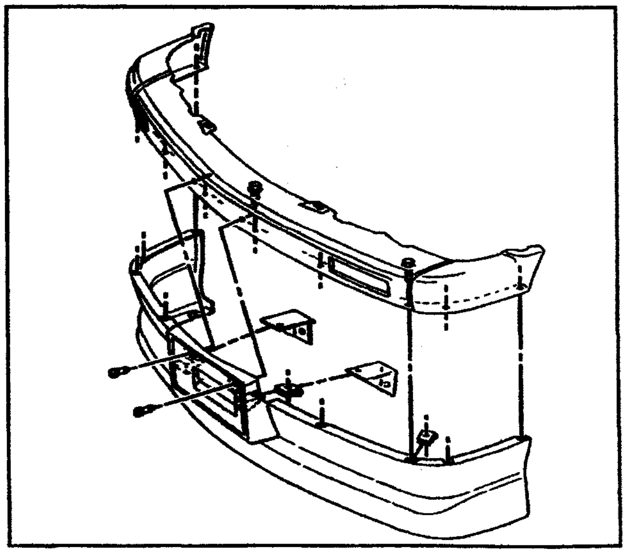


Figure 15—Front Bumper Fascia

3. Raise the vehicle.
4. Remove the air deflector panel. Refer to Air Deflector Panel Replacement in this section.
5. Remove two plastic fasteners from the fascia charge receptacle molding.
6. Remove the fascia bolts.
7. Remove the license bracket assembly. Refer to License Bracket Assembly Replacement in this section.
8. Remove the fascia.

Install or Connect (Figure 15)

1. Install the fascia with bolts.

Tighten

- Tighten the fascia bolts to 7 N.m (62 lb in).

2. Install the license bracket assembly. Refer to License Bracket Assembly Replacement in this section.
3. Install two plastic fasteners in the fascia charge receptacle molding.
4. Install the air deflector panel. Refer to Air Deflector Panel Replacement in this section.
5. Lower the vehicle.
6. Install the grille. Refer to Grille Replacement in this section.
7. Install the high-voltage disconnect. Refer to Battery Pack Controls.

REAR BUMPER IMPACT BAR AND BRACKET REPLACEMENT

Remove or Disconnect (Figure 16)

1. Remove license plate lamps. Refer to License Plate Lamp and Bulb Replacement in Lighting Systems.
2. Remove license plate screws from bumper.
3. Remove step pad from impact bar. Refer to Rear Bumper Step Pad Replacement in this section.
4. Remove two anchor plates and four washers from impact bar.
5. Remove four bolts and washers from top of impact bar.
6. Remove impact bar from the vehicle.
7. Remove anchor plate and two nuts from frame and bracket.
8. Remove bracket.

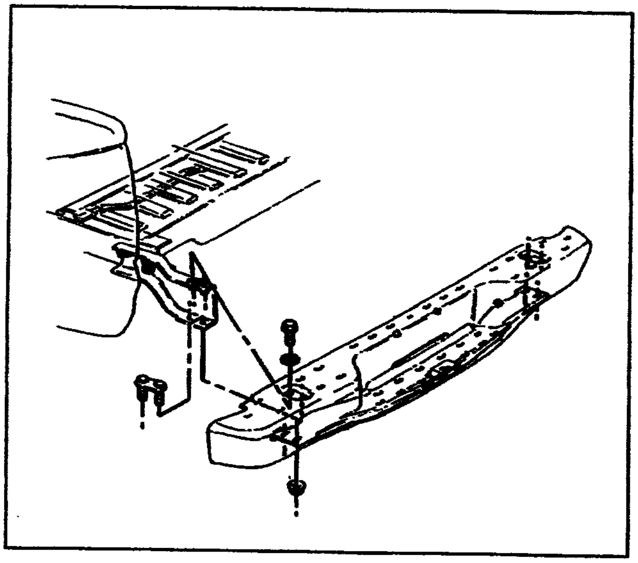


Figure 16—Rear Bumper Impact Bar

Install or Connect (Figure 16)

1. Install the bracket to the frame.
2. Install bracket-to-frame anchor plate and nuts.

Tighten

- Tighten anchor plate nuts to 90 N.m (66 lb. ft.).

3. Install rear bumper impact bar to brackets with four bolts and washers through top of impact bar.
4. Loose assemble rear bumper impact bar to brackets with two anchor plates and four nuts.
5. Position impact bar and tighten nuts.

Tighten

- Tighten anchor plate nuts to 90 N.m (66 lb. ft.).

6. Install license plate screws to bumper.
7. Install license plate lamps. Refer to License Plate Lamp and Bulb Replacement in Lighting Systems.

REAR BUMPER STEP PAD REPLACEMENT

Remove or Disconnect (Figures 17 and 18)

1. Remove the step pads from the bumper with a flat-bladed tool.

Install or Connect (Figures 17 and 18)

1. Install the step pads to the bumper.

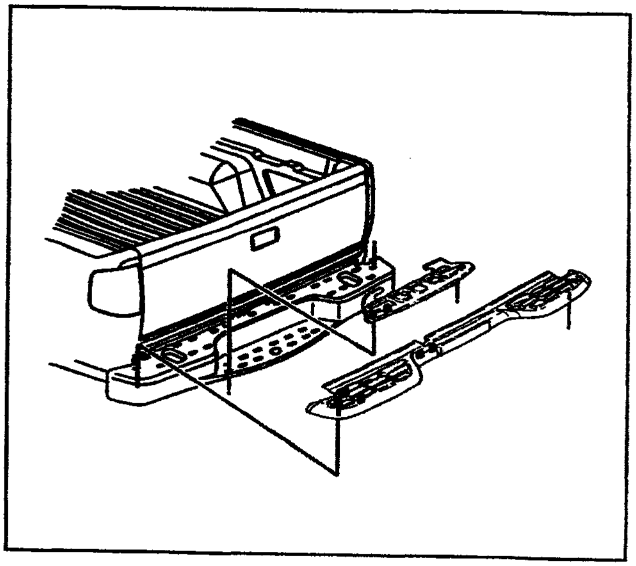


Figure 17—Rear Bumper Step Pad

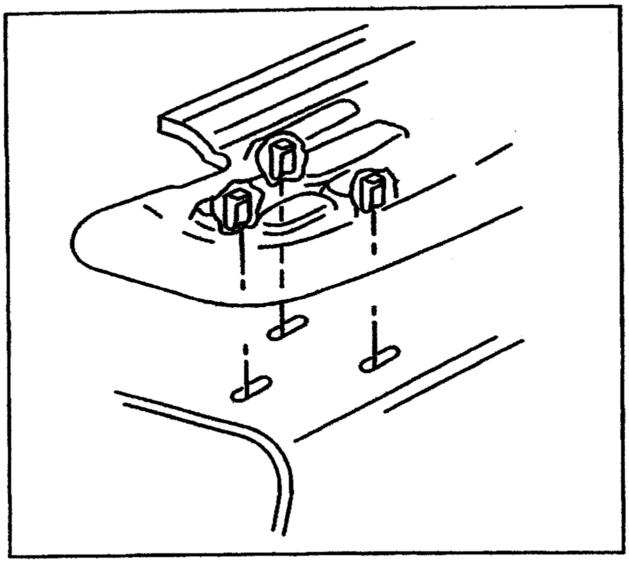


Figure 18—Rear Bumper Step Pad Retainers

REAR BUMPER EXTENSION REPLACEMENT

Remove or Disconnect (Figure 19)

1. Remove the rear bumper extension-to-rear wheel panel screws.
2. Remove the rear bumper extension-to-body nuts.
3. Remove the rear bumper extension from the vehicle.

Install or Connect (Figure 19)

1. Install the rear bumper extension to the vehicle.
2. Install the rear bumper extension-to-body nuts.

   Tighten

   - Tighten the nuts to 1.5 N.m (13 lb in).
3. Install the rear bumper extension-to-rear wheel panel screws.

   Tighten

   - Tighten the screws to 1.5 N.m (13 lb in).

POWER INVERTER MODULE (PIM) SUBFRAME REPLACEMENT

Remove or Disconnect (Figure 20)

1. Remove the Power Inverter Module. Refer to Drive Motor Controls.
2. Remove the accumulator from the subframe.
3. Remove the vacuum pump from the subframe.
4. Remove the coolant reservoir from the subframe.
5. Remove the 5-way valve from the subframe.
6. Remove three bolts, washers, nuts, and six insulators from the subframe.

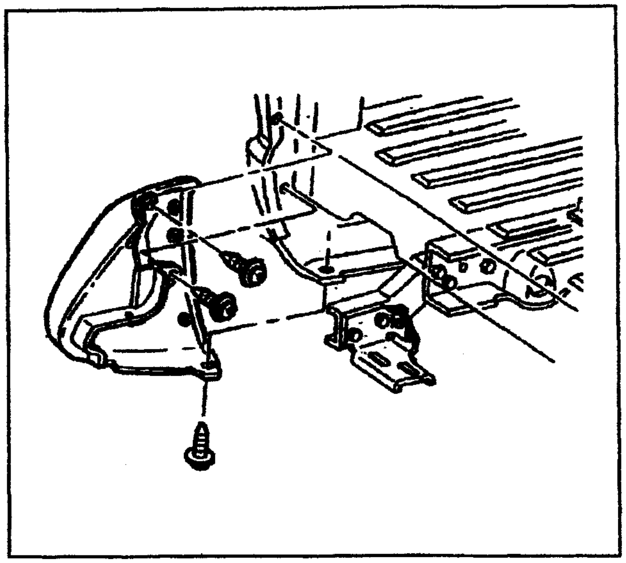


Figure 19—Rear Bumper Extension

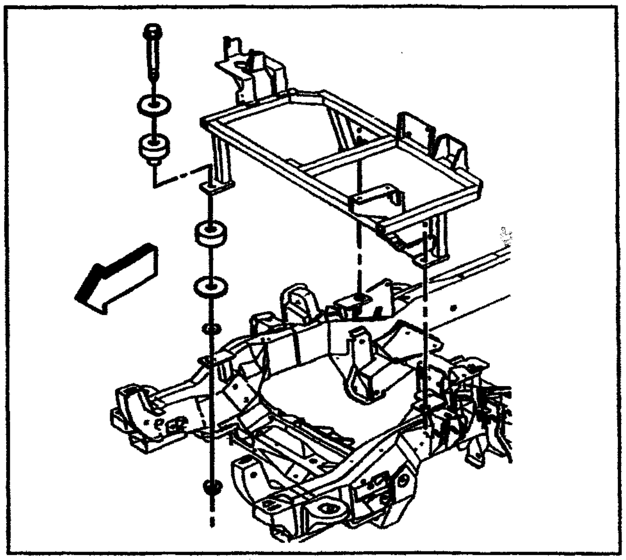


Figure 20—PIM Subframe

7. Remove the subframe from the vehicle.

Install or Connect (Figure 20)

1. Position subframe to vehicle frame.
2. Connect bolts, washers, nuts, and insulators to subframe.

   Tighten

   - Tighten the PIM subframe mounting bolts to 50 N.m (37 lb ft).
3. Connect coolant reservoir to subframe.
4. Install the vacuum pump to thesubframe. Refer to Vacuum Booster System.
5. Install the accumulator to the subframe. Refer to Heater, Ventilation, and Air Conditioning.
6. Install the 5-way valve to the subframe.
7. Install the Power Inverter Module. Refer to Drive Motor Controls.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N.m	Lb Ft	Lb In
Fascia Bolts	7	—	62
Front Bumper Brace Mounting Bolts	40	30	—
Front Bumper-to-Frame Bolts	40	30	—
Front End Cap-to-Air Deflector Bolts	7	—	62
Front End Cap-to-Bumper Nuts	7	—	62
Front License Plate Bracket-to-Front Bumper Screws	7	—	62
PIM Subframe Mounting Bolts	50	37	—
Rear Bumper Bracket to Bumper Nuts	90	66	—
Rear Bumper Bracket to Frame Nuts	90	66	—

SECTION 10A6

SHEET METAL AND FIBERGLASS

ON-VEHICLE SERVICE

RADIATOR GRILLE

Remove or Disconnect (Figure 1)

1. Remove the grille to radiator support screws.
   - Disconnect the side marker wiring with bulb and sockets.
2. Remove the grille from the vehicle.

Install or Connect (Figure 1)

1. Install the grille to the vehicle.
   - Connect the side marker wiring with bulbs and sockets.
2. Install the grille to the radiator support screws.

Tighten

- Tighten the grille to the radiator support screws to 1.4 N·m (12 lb in).

COWL VENT GRILLE

Remove or Disconnect (Figures 2 through 4)

1. Raise and support the hood.
2. Remove the right and left vent grille end panels (Figure 2).
3. Remove the windshield wiper arms. Refer to Windshield Wiper/Washer System (Pulse).
4. Remove the center vent grille panel-to-cowl screws and retainers.
5. Remove the center vent grille panel to cowl.

Install or Connect (Figures 2 through 4)

1. Install the center vent grille panel to the vehicle.

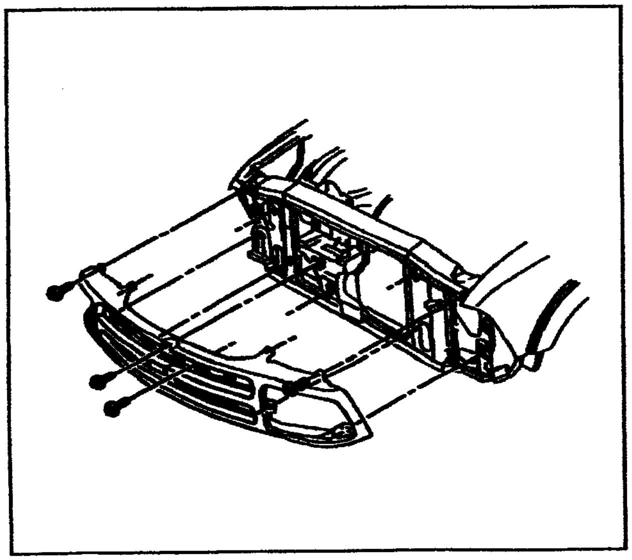


Figure 1—Radiator Grille

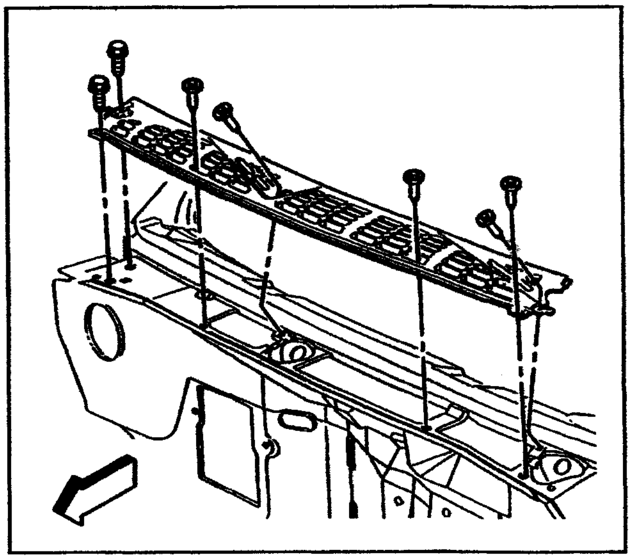


Figure 2—Cowl Vent Grille

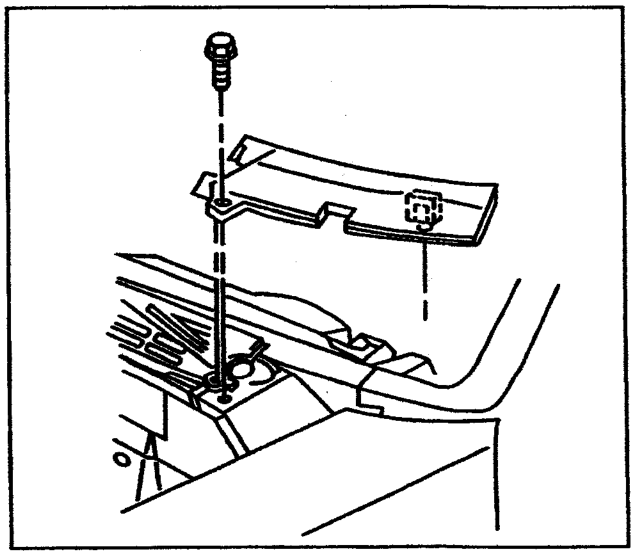


Figure 3—Cowl Vent Grille End Panel

2. Install the center vent grille panel-to-cowl retainers and screws.

Tighten

- Tighten the vent grille-to-cowl screws to 1.5 N.m (13 lb in).

3. Install the right and left vent grille end panels to cowl.

Tighten

- Tighten the vent grille end panel screws to cowl to 1.5 N.m (13 lb in).

4. Install the windshield wiper arms. Refer to Windshield Wiper/Washer System (Pulse).

RADIATOR UPPER AIR DEFLECTOR REPLACEMENT

Remove or Disconnect (Figure 5)

1. Remove the radiator grille. Refer to Radiator Grille in this section.
2. Remove the radiator upper air deflector retainers.
3. Remove the radiator upper air deflector.

Install or Connect (Figure 5)

1. Install the radiator upper air deflector.
2. Install the radiator upper air deflector retainers.
3. Install the radiator grille. Refer to Radiator Grille in this section.

RADIATOR LOWER INSULATOR PANEL

Remove or Disconnect (Figure 6)

1. Remove the charge receptacle. Refer to Drive Motor Controls.

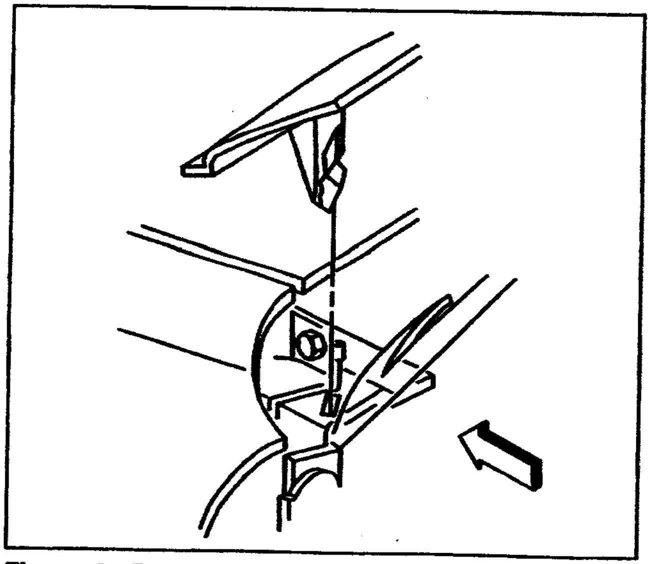


Figure 4—Position Tab—Cowl Vent Grille End Panel

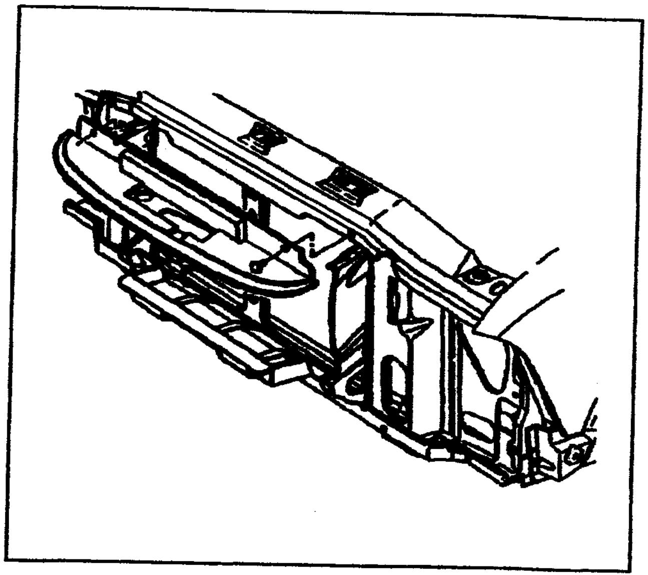


Figure 5—Radiator Upper Air Deflector

2. Remove the radiator lower insulator panel retainers.
3. Remove the radiator lower insulator panel.

Install or Connect (Figure 6)

1. Install the radiator lower insulator panel.
2. Install the radiator lower insulator panel retainers.
3. Install the charge receptacle. Refer to Drive Motor Controls.

RADIATOR AIR INTAKE BAFFLE

Remove or Disconnect (Figure 7)

1. Remove the radiator grille. Refer to Radiator Grille in this section.
2. Remove the radiator air intake baffle retainers.
3. Remove the radiator air intake baffle.

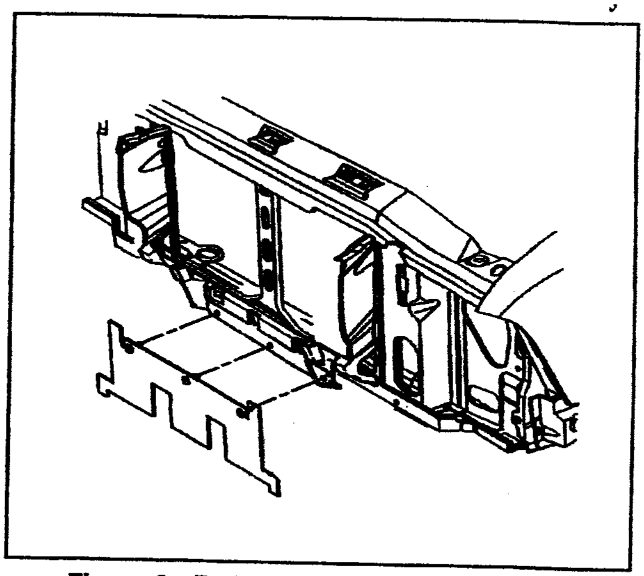


Figure 6—Radiator Lower Insulator Panel

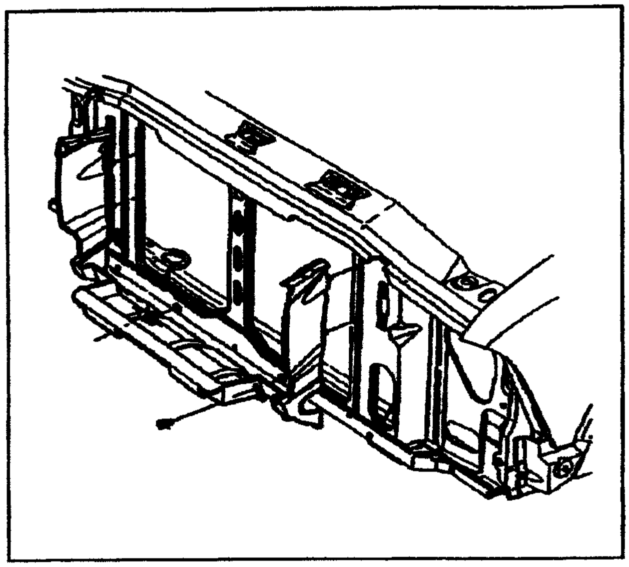


Figure 7—Radiator Air Intake Baffle

Install or Connect (Figure 7)

1. Install the radiator air intake baffle.
2. Install the radiator air intake baffle retainers.
3. Install the radiator grille. Refer to Radiator Grille in this section.

PRIMARY HOOD LATCH ASSEMBLY

Remove or Disconnect (Figures 8 and 9)

1. Raise and support hood.
2. Remove radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
3. Remove the cable from the latch assembly (Figure 8).
   - Use a flat-bladed tool to release clip and lift cable assembly from primary latch.

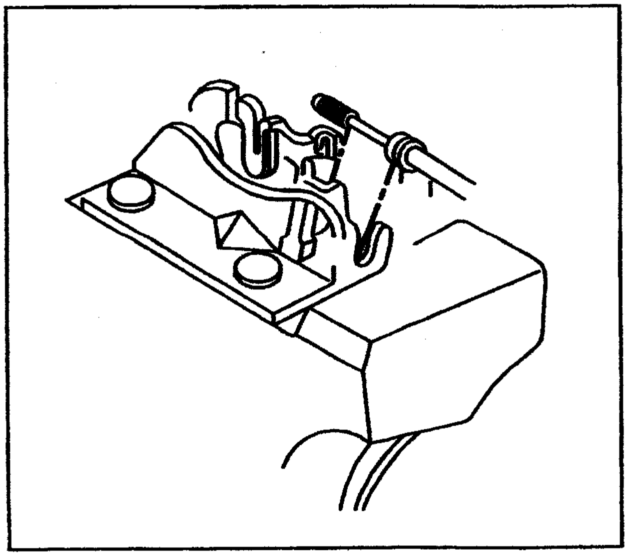


Figure 8—Primary Hood Latch and Release Cable

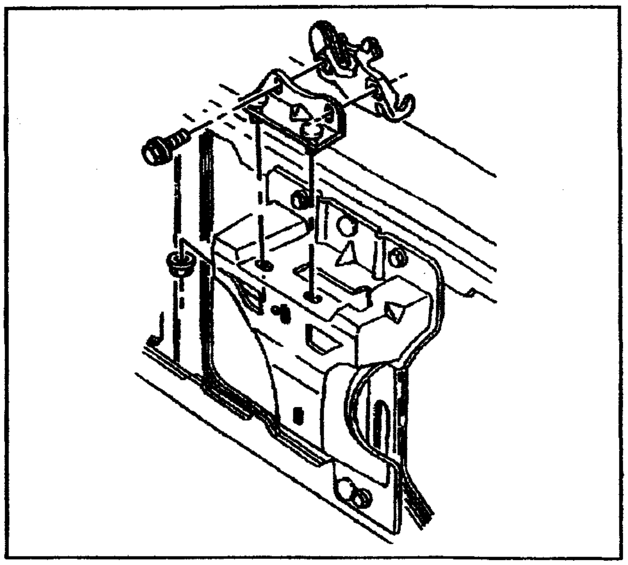


Figure 9—Primary Hood Latch and Bracket Assembly

4. Mark bolt-to-mounting bracket positions.
5. Remove the primary hood latch-to-mounting bracket bolts (Figure 9).
6. Remove the latch from the vehicle (Figure 9).

Install or Connect (Figures 8 and 9)

1. Install the latch to the vehicle (Figure 9).
2. Use marks to align latch.
3. Install the primary hood latch-to-mounting bracket bolts (Figure 9).

Tighten

- Tighten the primary hood latch-to-mounting bracket bolts to 25 N·m (18 lb ft).

4. Install the cable to the latch assembly.
5. Install the radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
6. Remove hood support and lower hood.

PRIMARY HOOD LATCH ADJUSTMENT

Inspect (Figures 9 and 10)

1. Release the primary hood latch to check pop-up spring operation.
2. Attempt to raise the hood while the hood is in the pop-up position. The hood should raise without the hood striker binding against the latch and the secondary hood latch should engage to prevent the hood from being raised.

Adjust

- Hood latch mounting bracket.

1. Remove radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
2. Loosen the primary hood latch support bracket-to-mounting bracket nuts.

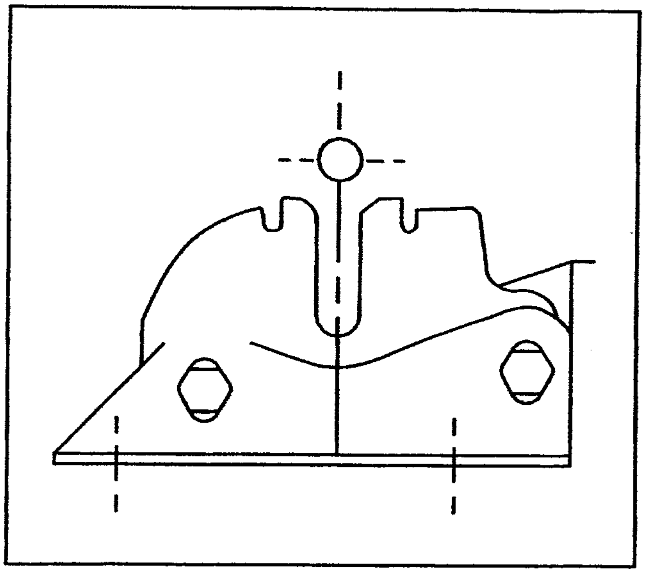


Figure 10—Primary Hood Latch-to-Striker Adjustment

3. Move hood latch from side to side until the striker enters the center of the latch assembly (Figure 10).

Tighten (Figure 9 and 10)

- Tighten the primary hood latch support bracket-to-mounting bracket bolts to 25 N.m (18 lb ft).

4. Install radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.

PRIMARY HOOD LATCH SUPPORT BRACKET REPLACEMENT

Remove or Disconnect (Figure 11)

1. Raise and support hood.
2. Remove the radiator grille. Refer to Radiator Grille in this section.
3. Remove the radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
4. Remove the primary hood latch assembly. Refer to Primary Hood Latch Assembly in this section.
5. Remove the primary hood latch support bracket-to-radiator support bolts.
6. Remove the primary hood latch support bracket from the vehicle.
7. Mark the position of latch mounting bracket-to-support bracket nuts.
8. Remove the primary latch mounting bracket from support bracket bolts.

Install or Connect (Figure 11)

1. Install the primary latch mounting bracket-to-support bracket bolts.

Tighten

- Tighten the bracket bolts to 25 N.m (18 lb ft).

2. Install the primary latch support bracket to vehicle.

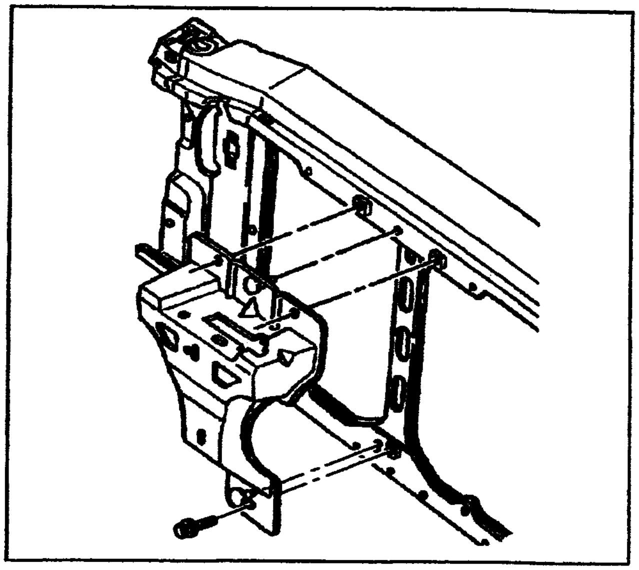


Figure 11—Primary Hood Latch Support Bracket

3. Install the primary latch support bracket-to-radiator support bolts.

Tighten

- Tighten the bracket-to-radiator bolts to 25 N.m (18 lb ft).

4. Install the primary hood latch assembly. Refer to Primary Hood Latch Assembly in this section.
5. Install the radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
6. Install the radiator grille. Refer to Radiator Grille in this section.

PRIMARY HOOD LATCH RELEASE CABLE REPLACEMENT

Remove or Disconnect (Figures 8, 12 and 13)

1. Raise and support the hood.
2. Remove the radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.
3. Remove the hood latch cable from the primary latch assembly (Figure 8).
   - Use a flat-bladed tool to release clip and lift cable assembly from primary latch.
   - To aid in installation, tie mechanic's wire to the end of cable.
4. Remove the hood release cable retaining clips (Figure 12).
   - Pry open with a flat-bladed tool.
5. Remove the hood release cable grommet (Figure 13).
6. Remove the left cowl side trim panel. Refer to Interior Trim.
7. Remove the hood release cable and lever bolts from the cowl side panel.

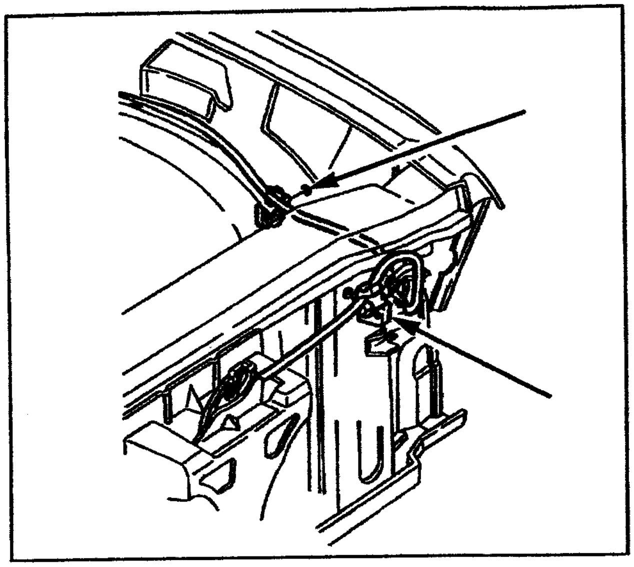


Figure 12—Hood Latch Cable Retaining Clips

8. Remove the hood latch cable assembly from vehicle (Figure 13).
   - Guide cable through cowl panel underneath instrument panel from inside of vehicle.

Install or Connect (Figures 8, 12 and 13)

1. Install the hood latch cable assembly to vehicle (Figure 13).
   - Guide cable through cowl panel underneath instrument panel from inside of the vehicle.

Tighten

- Tighten the hood release cable and lever bolts to 9 N.m (80 lb in).

2. Install the hood release cable and lever bolts to the cowl side panel (Figure 13).
3. Install the hood release cable to the retaining clips (Figure 12).
4. Install the hood release cable grommet (Figure 13).
5. Install the left cowl side trim panel. Refer to Interior Trim.
6. Install the hood latch cable to the latch.
7. Install the radiator upper air deflector. Refer to Radiator Upper Air Deflector Replacement in this section.

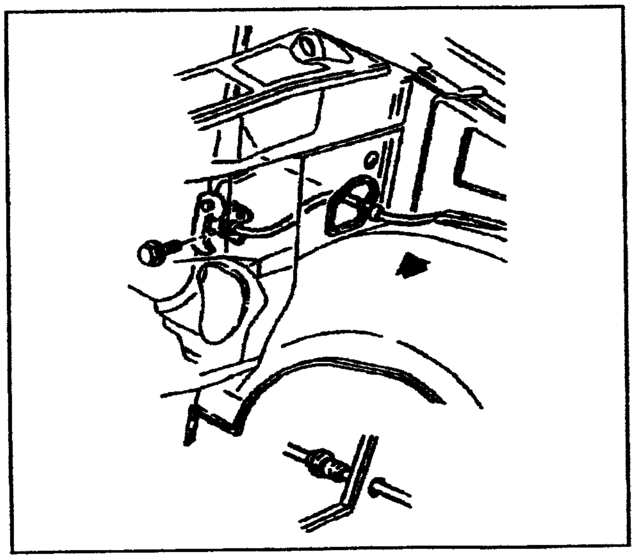


Figure 13—Hood Latch Release Cable Assembly

SECONDARY HOOD LATCH ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 14)

1. Raise and support the hood.
2. Remove the latch assembly to hood bolts.
3. Remove the latch assembly from the hood.

Install or Connect (Figure 14)

1. Install the latch assembly to the hood.
2. Install the latch assembly to secondary hood latch bolts.

Tighten

- Tighten the bolts to 25 N.m (18 lb ft).

HOOD POP-UP SPRING REPLACEMENT

Remove or Disconnect (Figure 15)

1. Remove the spring from the hood.
   - Carefully push in the hood-mounted end of spring with a flat-bladed tool to release from retainers.

Install or Connect (Figure 15)

1. Install the spring to the hood.
   - Insert spring into hood retainers.

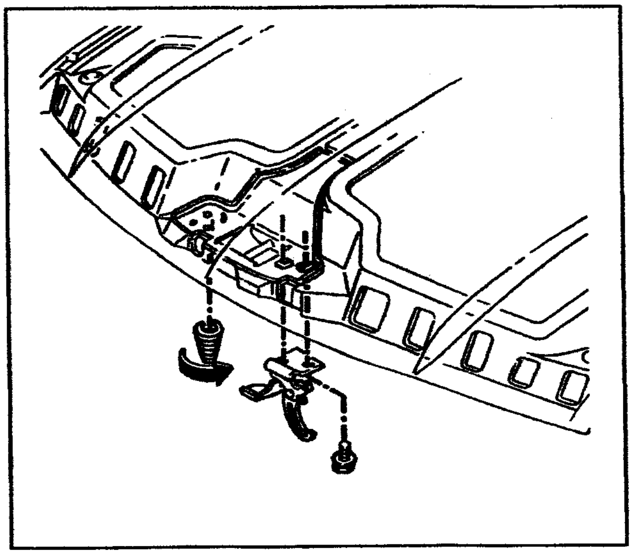


Figure 14—Secondary Hood Latch Assembly

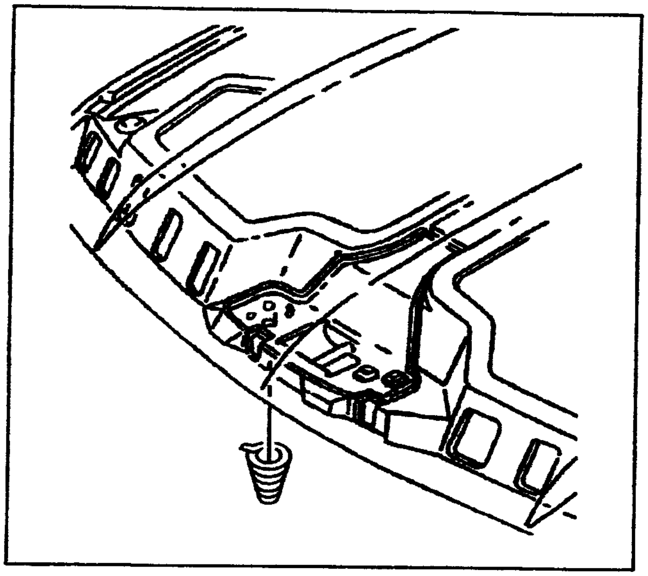


Figure 15—Hood Pop-Up Spring

HOOD SUPPORT ROD REPLACEMENT

Remove or Disconnect (Figure 16)

1. Raise and safely support hood with something other than the hood support rod.
2. Remove the hood support rod from retainers.
    - Pull bottom of rod towards you to release rod from bottom retainer.
3. Remove the retainers from the radiator support.

Install or Connect (Figure 16)

1. Install the retainers to the radiator support.
2. Install the hood support rod to retainers.
    - Remove temporary hood support.

HOOD REPLACEMENT

Remove or Disconnect (Figure 17)

1. Raise and support the hood.
2. Install protective coverings over the fenders.
3. Remove the right and left cowl vent grille panels. Refer to Cowl Vent Grille in this section.
4. Disconnect the underhood lamp wire. Refer to Lighting Systems.
5. Disconnect the windshield washer hoses.
6. Disconnect the vacuum hose from reservoir.
7. Remove the hood hinge attaching bolts/nuts.
8. Remove the hood from the vehicle.

Install or Connect (Figure 17)

1. Install the hood to the vehicle.
2. Install the hood hinge attaching bolts/nuts.

Tighten

- Tighten the hood hinge nuts to 25 N.m (18 lb ft).

3. Connect the vacuum hose to reservoir.

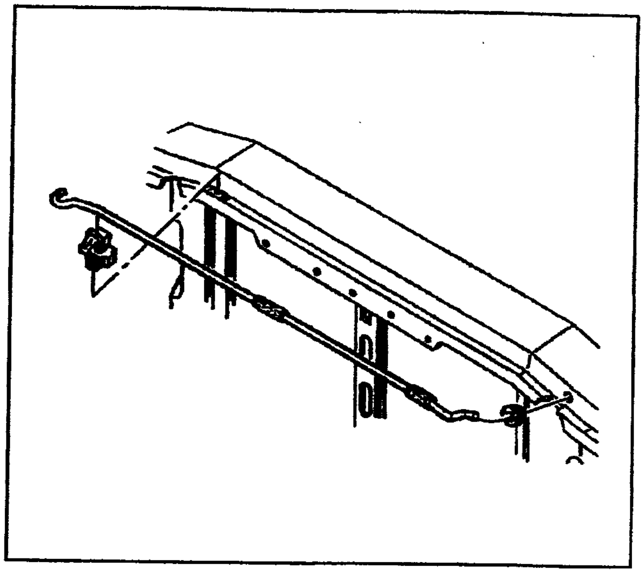


Figure 16—Hood Support Rod

4. Connect the windshield washer hoses.
5. Connect the underhood lamp wire. Refer to Lighting Systems.
6. Install the right and left cowl vent grille panels. Refer to Cowl Vent Grille in this section.

HOOD INSULATOR

Remove or Disconnect (Figure 18)

Tools Required:
J 38778 Door Trim Pad and Garnish Clip Remover

1. Remove the insulator to hood retainers using J 38778.
2. Remove the insulator from the hood.

Install or Connect (Figure 18)

1. Install the insulator to the hood.
2. Install the retainers to the hood.

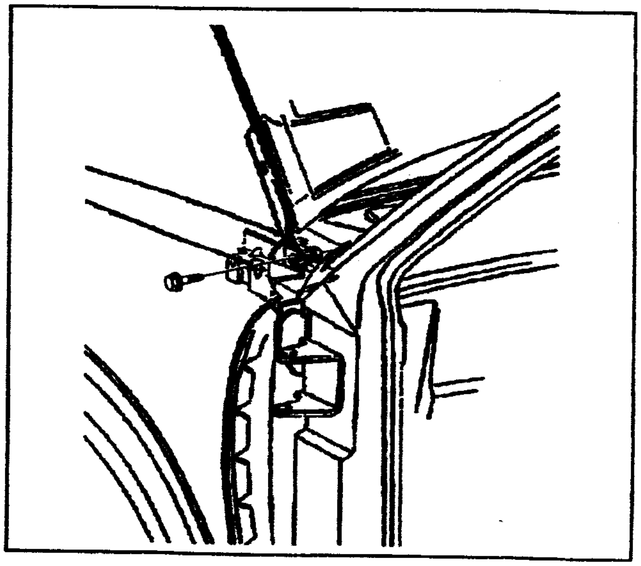


Figure 17—Hood Hinge

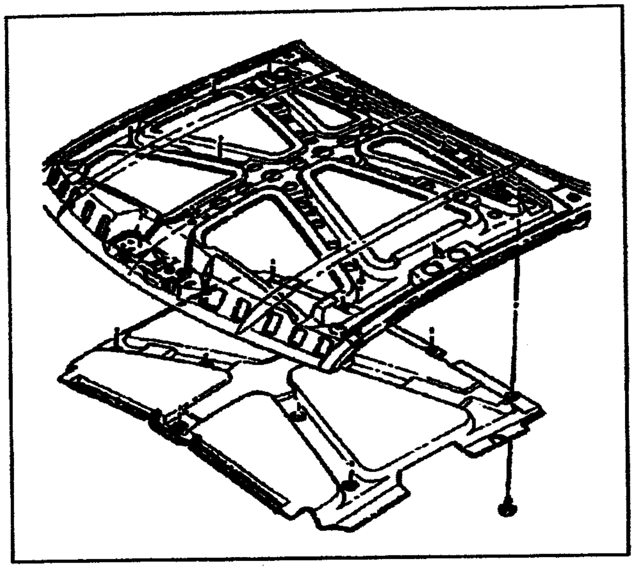


Figure 18—Hood Insulator

HOOD FRONT SEAL REPLACEMENT

Remove or Disconnect (Figure 19)

1. Remove the seal assembly.
   - Carefully pry seal assembly from flange with a flat-bladed tool.

Install or Connect (Figure 19)

1. Install the seal assembly.
   - Position assembly.
   - Press assembly into place.

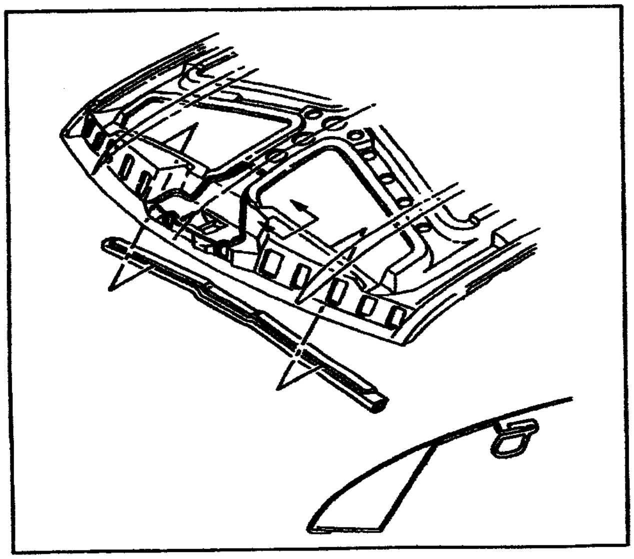


Figure 19—Hood Front Seal

HOOD COWL PLENUM SEAL REPLACEMENT

Remove or Disconnect (Figure 20)

1. Remove the hood-to-cowl plenum seal assembly from flange.
   - Remove the cowl plenum screws.
   - Carefully break adhesive bond with a flat-blade tool.
   - Pull seal assembly from cowl plenum flange.

Clean

- Clean the flange.
- Use a suitable solvent such as a mixture of 50 percent isopropyl alcohol and 50 percent water or high-flash naphtha. Dry the area thoroughly.

Install or Connect (Figure 20)

1. Install the seal assembly.
   - Remove the liner from the adhesive strip.
   - Position the assembly.
   - Press assembly into place and apply pressure.
2. Install the cowl plenum seal screws.

Tighten

- Tighten the cowl plenum seal screws to 1.9 N.m (17 lb in).

HOOD ADJUST FRONT BUMPER

To aid in adjustment, measure hood adjust front bumper before removing.

Remove or Disconnect (Figure 21)

1. Remove the hood adjust front bumper.
   - Rotate counterclockwise.

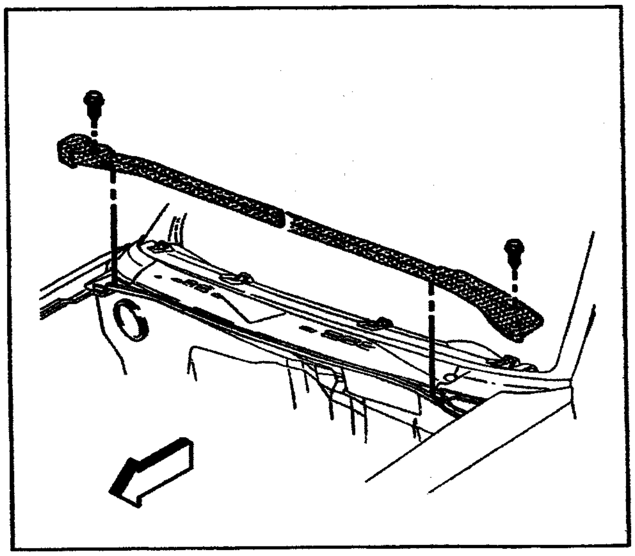


Figure 20—Hood-to-Cowl Plenum Seal

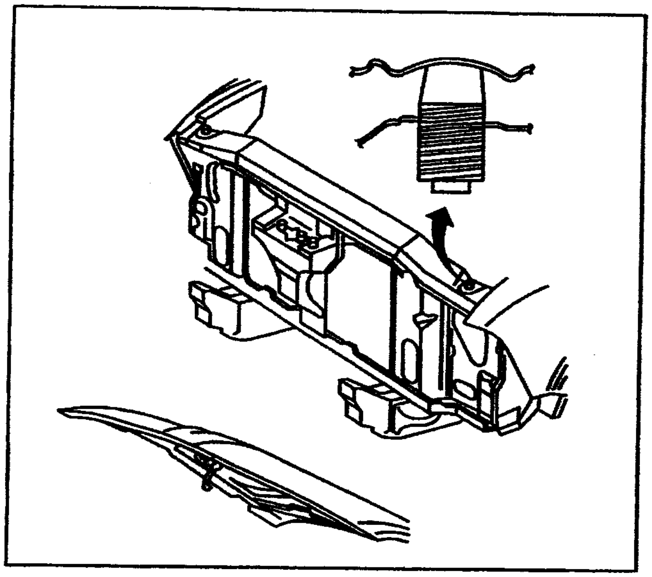


Figure 21—Hood Adjust Front Bumper

Install or Connect (Figure 21)

1. Install the hood adjust front bumpers.
   - Rotate clockwise until hood adjust front bumper is at the same height as measured before removal.

Adjust

- Check hood panel assembly alignment. The top of the hood should be flush with the fenders and parallel to the grille.
- Align the hood by rotating bumper clockwise or counterclockwise.

FENDER-MOUNTED HOOD BUMPER REPLACEMENT

Remove or Disconnect (Figure 22)

1. Remove the fender-mounted hood bumpers from fender.
   - Slide bumper rearward and pull the bottom part of bumper through hole in slot.

Install or Connect (Figure 22)

1. Install the fender-mounted hood bumpers to fender.
   - Pull the bottom part of bumper through the hole in slot.

FENDER REPLACEMENT

Right Fender

Remove or Disconnect (Figures 23 through 26)

1. Remove the radiator grille. Refer to Radiator Grille in this section.
2. Remove the bumper end cap. Refer to Frame and Bumpers.

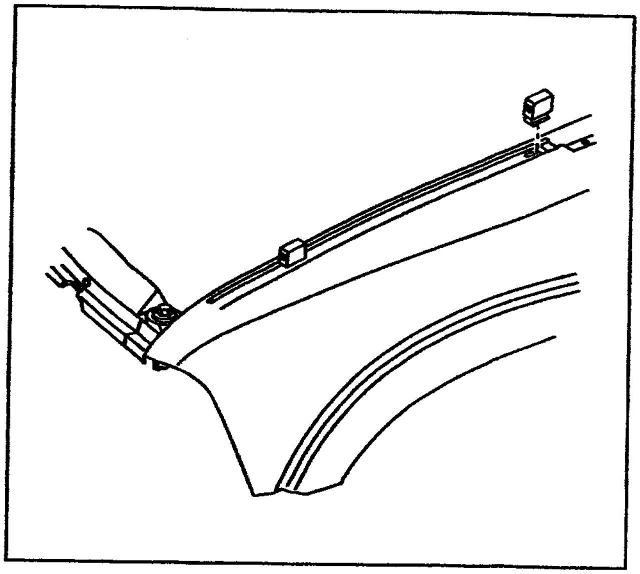


Figure 22—Fender-Mounted Hood Bumpers

3. Remove the hood. Refer to Hood Replacement in this section.
4. Remove the antenna mast and base. Refer to Audio Systems.
5. Remove the battery. Refer to Auxiliary Storage Battery.
6. Remove the radiator coolant bottle. Refer to Propulsion System Cooling.
7. Remove the fender-to-radiator support bolts (Figure 23).
8. Remove the fender-to-reinforcement bolt (Figure 24).
9. Remove the fender-to-cowl bolts (Figure 24).
10. Remove the fender-to-door hinge bolts (Figure 24).
11. Remove the fender-to-rocker panel bolts.
12. Remove the fender-to-wheel house bolts (Figure 26).
13. Disconnect the wiring and vacuum lines from the fender.
14. Remove the fender from the vehicle.

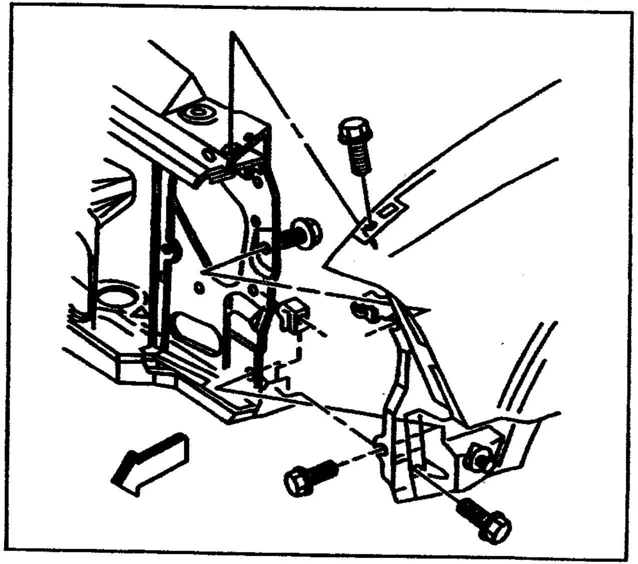


Figure 23—Fender-to-Radiator Support

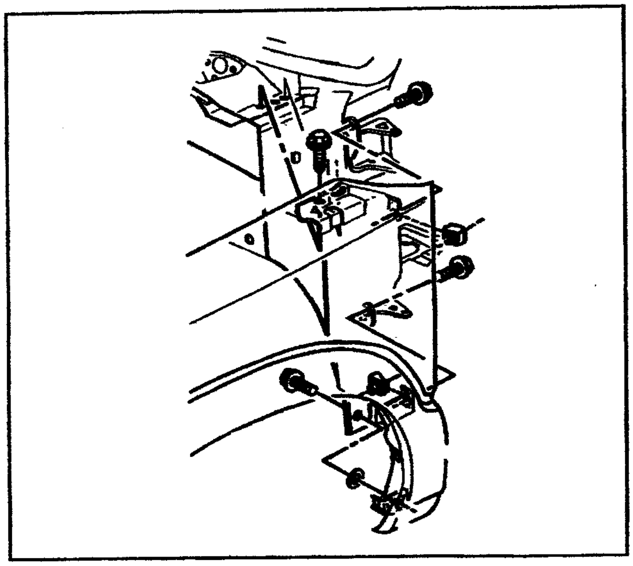


Figure 24—Fender-to-Cowl Bolts

Install or Connect (Figures 23 through 26)

1. Install the fender to the vehicle (Figure 21).
2. Connect the wiring and vacuum lines to the fender.
3. Install the fender-to-wheel house bolts (Figure 26).

   Tighten

   - Tighten the fender bolts to 29 N.m (21 lb ft).
4. Install the fender-to-door hinge bolts (Figure 24).

   Tighten

   - Tighten the fender-to-door hinge bolts to 29 N.m (21 lb ft).
5. Install the fender to the cowl (Figure 24).

   Tighten

   - Tighten the fender-to-door frame bolt to 29 N.m (21 lb ft).
6. Install the fender-to-reinforcement bolt.

   Tighten

   - Tighten the fender-to-reinforcement bolt to 29 N.m (21 lb ft).
7. Install the fender-to-radiator support bolts (Figure 23).

   Tighten

   - Tighten the fender-to-support bolts to 29 N.m (21 lb ft).
8. Install the radiator coolant bottle. Refer to Propulsion System Cooling.
9. Install the auxiliary battery. Refer to Auxiliary Storage Battery.
10. Install the antenna mast and base. Refer to Audio Systems.
11. Install the hood. Refer to Hood Replacement in this section.

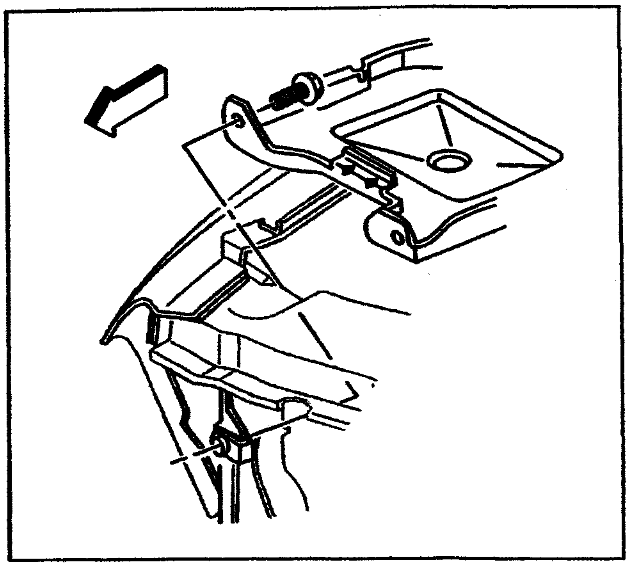


Figure 25—Fender/Battery Tray-to-Radiator Support Bolt

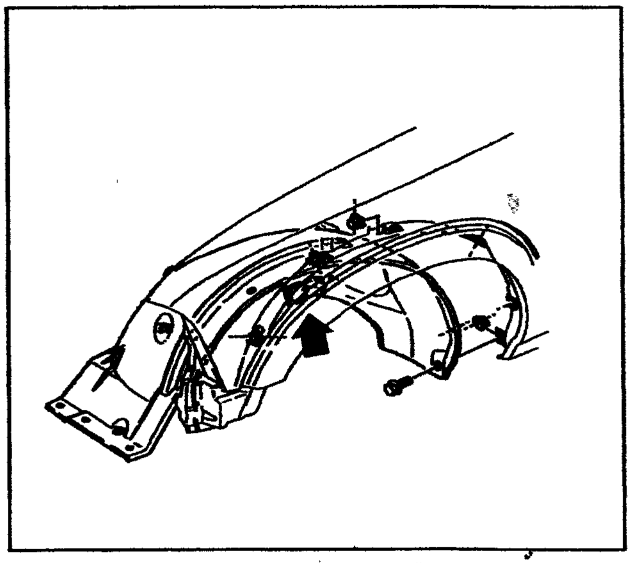


Figure 26—Wheel House to Fender Bolts

12. Install the bumper end cap. Refer to Frame and Bumpers.
13. Install the radiator grille. Refer to Radiator Grille in this section.

Left Fender

Remove or Disconnect (Figures 23 through 26)

1. Remove the radiator grille. Refer to Radiator Grille in this section.
2. Remove the bumper end cap. Refer to Frame and Bumpers.
3. Remove the hood. Refer to Hood Replacement in this section.
4. Remove the windshield wiper fluid bottle. Refer to Windshield Wiper/Washer System (Pulse).
5. Remove the horn from the fender.

6. Remove the hood latch cable. Refer to Primary Hood Latch Release Cable Replacement in this section.
7. Remove the brake pressure modulator valve mounting bolt from fender.
8. Remove the fender-to-radiator support bolts.
9. Remove the fender-to-reinforcement bolt (Figure 24).
10. Remove the fender-to-rocker panel bolt (Figure 23).
11. Remove the fender-to-door hinge bolts (Figure 24).
12. Remove the fender-to-wheel house panel bolts (Figure 26).
13. Remove the wiring and junction block from fender.
14. Remove the fender from the vehicle.

→← Install or Connect (Figures 23 through 26)

1. Install the fender to the vehicle.
2. Install the wiring to the fender.
3. Install the fender-to-wheel house panel bolts (Figure 26).

Tighten

- Tighten the fender-to-wheel house panel bolts to 29 N.m (21 lb ft).

4. Install the fender-to-reinforcement bolt.

Tighten

- Tighten the fender-to-reinforcement bolt to 29 N.m (21 lb ft).

5. Install the fender-to-radiator support bolts (Figure 23).

Tighten

- Tighten the fender-to-radiator support bolts to 29 N.m (21 lb ft).

6. Install the fender-to-door hinge bolts (Figure 24).

Tighten

- Tighten the fender-to-door hinge bolts to 29 N.m (21 lb ft).

7. Install the fender-to-cowl bolt (Figure 24).

Tighten

- Tighten the fender-to-cowl bolt to 29 N.m (21 lb ft).

8. Install the brake pressure modulator valve mounting bolts to the fender.
9. Install the hood latch cable.
10. Install the horn to the fender.
11. Install the windshield wiper fluid bottle.
12. Install the hood.
13. Install the bumper end cap.
14. Install the radiator grille.

WHEEL HOUSE PANEL REPLACEMENT

Right Panel

←→ Remove or Disconnect (Figures 26 through 28)

1. Disconnect the auxiliary battery cables. Refer to Auxiliary Storage Battery.
2. Remove the auxiliary battery from the vehicle. Refer to Auxiliary Storage Battery.
3. Remove the battery tray.
4. Remove the VCM/PCM from the coolant recovery bottle.
5. Remove the coolant recovery bottle. Refer to Propulsion System Cooling.
6. Remove the wheel house-to-radiator support bolts (Figure 27).

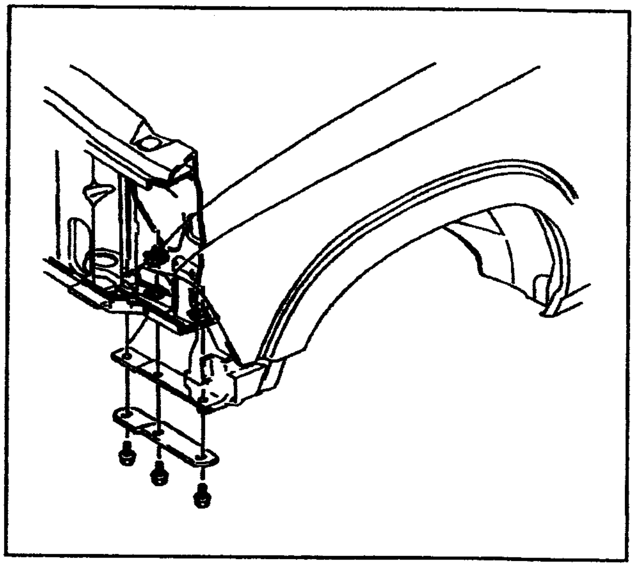


Figure 27—Wheel House Panel to Radiator Support Bolts

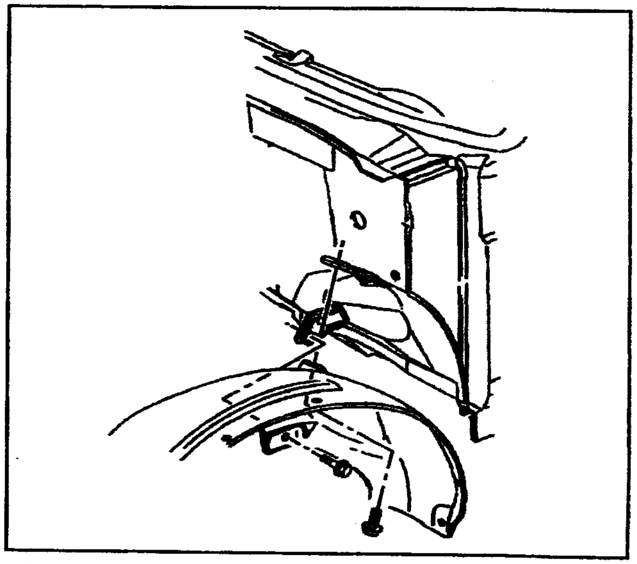


Figure 28—Wheel House Panel to Cowl Fastener

7. Remove the wheel house-to-fender bolts (Figure 28).
8. Remove the wheel house panel-to-cowl bolt (Figure 28).
9. Remove the wheel house panel from fender (Figure 26).
10. Remove the splash shield from wheel house panel. Refer to Wheel House Splash Shield Replacement in this section.

Install or Connect (Figures 26 through 28)

1. Install the splash shield to the wheel house panel.
2. Install the wheel house panel to the fender.
3. Install the wheel house panel to cowl bolt.

Tighten

- Tighten the wheel house panel-to-cowl bolts to 29 N.m (21 lb ft).

4. Install the wheel house panel-to-fender bolts.

Tighten

- Tighten the wheel house panel-to-fender bolts to 29 N.m (21 lb ft).

5. Install the wheel house panel-to-radiator support bolts.

Tighten

- Tighten the wheel house panel-to-radiator support bolts to 29 N.m (21 lb ft).

6. Install the coolant recovery bottle.
7. Install the VCM/PCM to the coolant recovery bottle.
8. Install the battery tray.
9. Install the auxiliary battery. Refer to Auxiliary Storage Battery.
10. Connect the auxiliary battery cables. Refer to Auxiliary Storage Battery.

Left Panel

Remove or Disconnect (Figures 26 through 28)

1. Disconnect the negative auxiliary battery cable. Refer to Auxiliary Storage Battery.
2. Remove the windshield wiper fluid bottle. Refer to Windshield Wiper/Washer System (Pulse).
3. Remove the wheel house panel-to-brake pressure modulator valve bolts. Refer to Four Wheel Antilock Brake System.
4. Remove the wheel house panel-to-radiator support bolts (Figure 27).
5. Remove the wheel house panel-to-fender bolts (Figure 26).
6. Remove the wheel house panel-to-cowl bolts (Figure 28).
7. Remove the wheel house panel from the fender.
8. Remove the splash shield from the wheel house panel. Refer to Wheel House Splash Shield Replacement in this section.

Install or Connect (Figures 26 through 28)

1. Install the splash shield to the wheel house panel.
2. Install the wheel house to the fender.
3. Install the wheel house panel to the cowl.

Tighten

- Tighten the wheel house panel-to-cowl bolt to 29 N.m (21 lb ft).

4. Install the wheel house panel-to-fender bolts.

Tighten

- Tighten the wheel house panel-to-fender bolts to 29 N.m (21 lb ft).

5. Install the wheel house-to-radiator support bolts.

Tighten

- Tighten the wheel house panel-to-radiator support bolts to 27 N.m (20 lb ft).

6. Install the wheel house-to-brake pressure modulator valve bolts.
7. Install the windshield wiper fluid bottle.
8. Connect the negative auxiliary battery cable. Refer to Auxiliary Storage Battery.

WHEEL HOUSE SPLASH SHIELD REPLACEMENT

Remove or Disconnect (Figure 29)

1. Remove the wheel house splash shield retainers.
2. Remove the wheel house splash shield.

Install or Connect (Figure 29)

1. Install the wheel house splash shield.
2. Install the wheel house splash shield retainers.

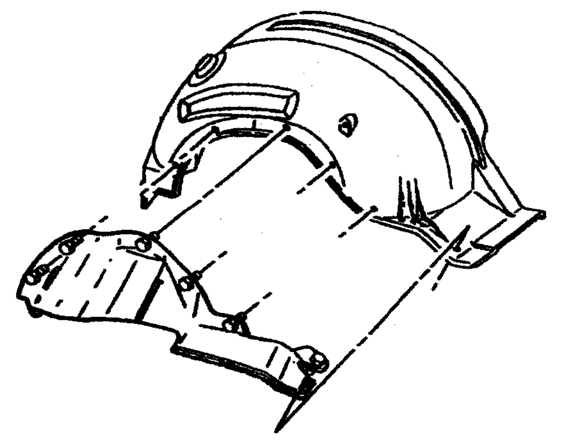


Figure 29—Wheel House Splash Shield Replacement

AIR DEFLECTOR PANEL REPLACEMENT

Remove or Disconnect (Figure 30)

1. Raise the vehicle on a hoist.
2. Remove two bolts securing the panel to the frame.
3. Remove eight bolts securing the panel to the fascia.
4. Remove the panel.

Install or Connect (Figure 30)

1. Install the air deflector panel to the frame with two bolts.

   Tighten

   - Tighten the bolts to 32.5 N.m (24 lb ft).

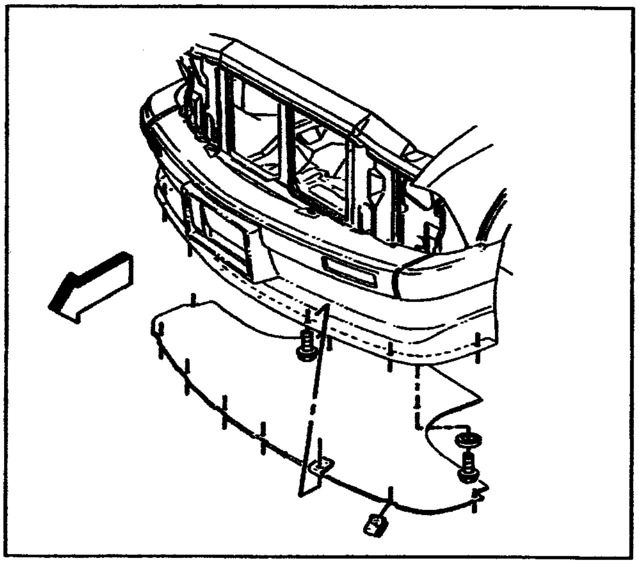


Figure 30—Air Deflector Panel

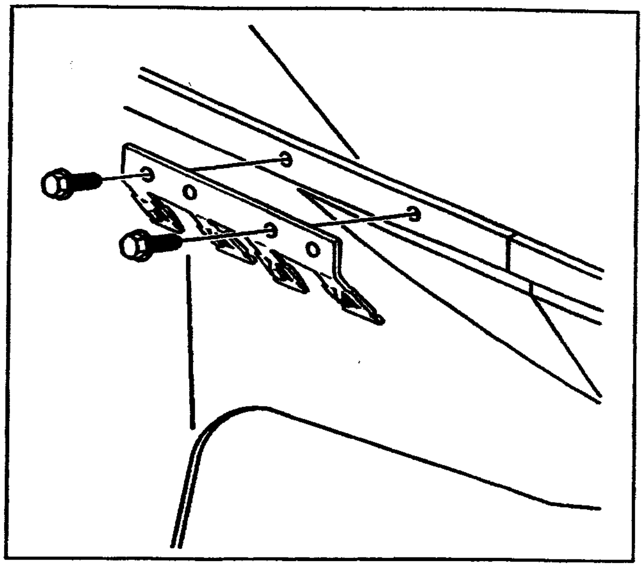


Figure 31—Relay Bracket

2. Install eight bolts securing the air deflector panel to the fascia.

   Tighten

   - Tighten the bolts to 6 N.m (53 lb in).
3. Lower the vehicle.

Relay Bracket Replacement

Remove or Disconnect (Figure 31)

1. Remove Relays from bracket.
2. Remove bracket from cowl.

Install or Connect (Figures 31 and 32)

1. Install braket to cowl with two screws.
   - If new bracket is being installed, refer to Figure 32 for the diminsions needed to drill a new mounting hole.
2. Install relays to bracket.

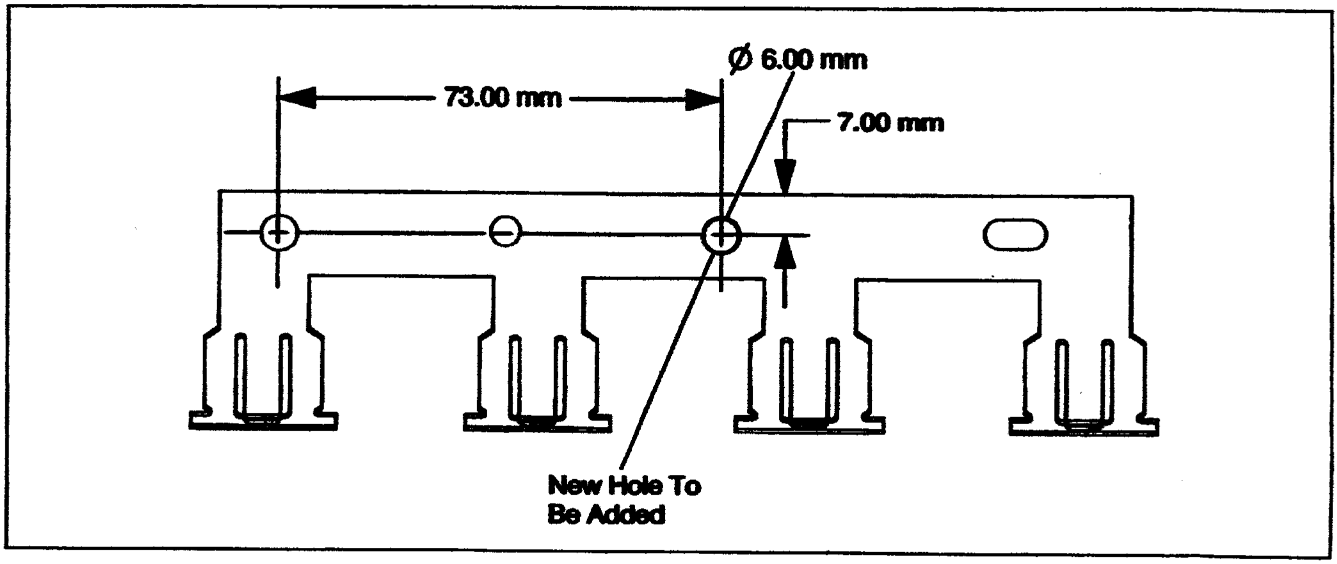


Figure 32—Relay Bracket Hole Guide

RADIATOR SUPPORT REPLACEMENT

Remove or Disconnect (Figures 27, 30 and 33)

1. Remove the auxiliary battery. Refer to Auxiliary Storage Battery.
2. Remove the bumper. Refer to Frame and Bumpers.
3. Remove the radiator grille. Refer to Radiator Grille in this section.
4. Remove the headlamp assemblies. Refer to Lighting Systems.
5. Remove the hood release cable from the support and hood latch. Refer to Primary Hood Latch Release Cable Replacement in this section.
6. Remove the latch support. Refer to Primary Hood Latch Support Bracket Replacement in this section.
7. Remove the front wiring harness from the clips.
8. Remove the ground screws from the radiator support.
9. Remove the battery tray to the radiator support bolts. Refer to Auxiliary Storage Battery.
10. Remove the radiator air intake baffle from vehicle. Refer to Radiator Air Intake Baffle in this section.
11. Remove the air conditioning condenser to the radiator support bolts, if equipped. Refer to Heater, Ventilation, and Air Conditioning.
12. Remove the hood support rod. Refer to Hood Support Rod Replacement in this section.
    - Raise and support the hood.
13. Remove the radiator support to the right and left fender bolts (Figure 27).
14. Remove the radiator support to the right and left wheel house panel bolts (Figure 27).
15. Remove the left wheel house panel to the fender bolts. Refer to Wheel House Panel Replacement in this section.
16. Remove the radiator support to the frame bolts (Figure 33).
17. Remove the radiator support frame mounts (Figure 33).
18. Remove the radiator support from the frame (Figure 33).
    A. Lightly push the left fender away from the vehicle to allow clearance between the fender and radiator support.
    B. Slide the left side of the support away from the vehicle.

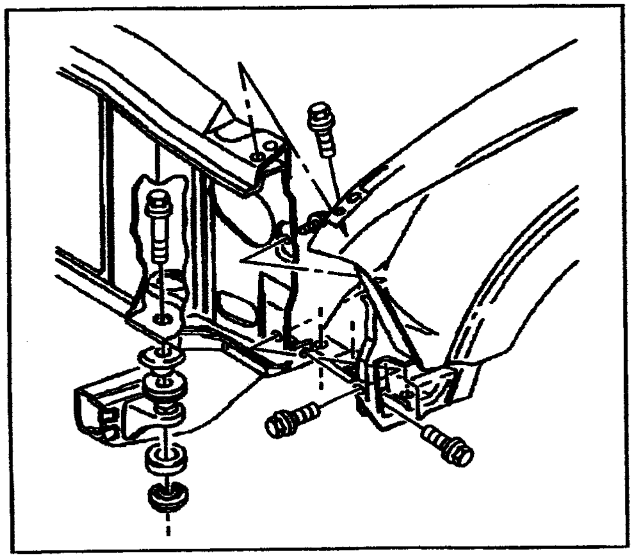


Figure 33—Radiator Support-to-Frame and Fender Bolts

Install or Connect (Figures 27, 30 and 33)

1. Install the radiator support to the frame.
    A. Lightly push the left fender away from the vehicle to allow clearance between the fender and radiator support.
    B. Slide the right side of the support onto the frame and pivot the left side of the support into place.
2. Install the radiator support to the frame mounts.
3. Install the bolts through the frame mount.

Tighten

- Tighten the bolts to 70 N.m (52 lb ft).

4. Install the hood support rod.
5. Install the left wheel house panel-to-fender bolts.

Tighten

- Tighten the bolts to 29 N.m (21 lb ft).

6. Install the radiator support to the right and left wheel house panel bolts.

Tighten

- Tighten the bolts to 27 N.m (20 lb ft).

7. Install the radiator support to the right and left fender bolts.

Tighten

- Tighten the fender bolts to 29 N.m (21 lb ft).

8. Install the air conditioning condenser to the radiator support bolts, if equipped.
9. Install the radiator support baffle to the vehicle.
10. Install the battery tray to radiator support bolts.

Tighten

- Tighten the bolts to 29 N.m (21 lb ft).

11. Install the ground screws to the radiator support.
12. Install the front wiring harness to the clips.
13. Install the latch support.
14. Install the hood release cable to the support and the hood latch.
15. Install the headlamp assemblies.
16. Install the radiator grille.
17. Install the bumper.
18. Install the auxiliary battery. Refer to Auxiliary Storage Battery.
19. Lower the hood carefully. Check the latch adjustment.

FUEL FILLER DOOR REPLACEMENT

Remove or Disconnect (Figure 34)

1. Remove the fuel filler door bolts.
2. Remove the fuel filler door.

Install or Connect (Figure 34)

1. Install the fuel filler door.
2. Install the fuel filler door bolts.

Tighten

- Tighten the fuel filler door bolts to 1.9 N.m (17 lb in).

FUEL FILLER POCKET REPLACEMENT

Remove or Disconnect (Figure 35)

1. Remove the fuel filler pocket-to-body bolts.
2. Remove the fuel filler pocket-to-fuel filler bolts.
3. Remove the fuel filler pocket from vehicle.

Install or Connect (Figure 35)

1. Install the fuel filler pocket to vehicle.
2. Install the fuel filler pocket-to-fuel filler bolts.
3. Install the fuel filler pocket-to-body bolts.

Tighten

- Tighten the fuel filler pocket bolts to 6 N.m (53 lb in).

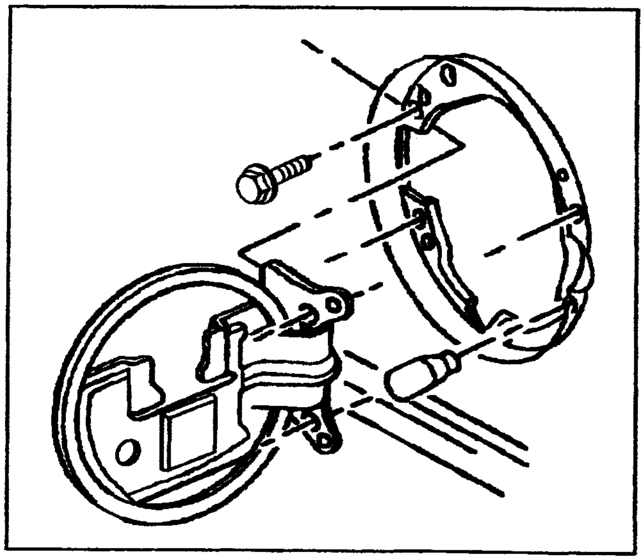


Figure 34—Fuel Filler Door

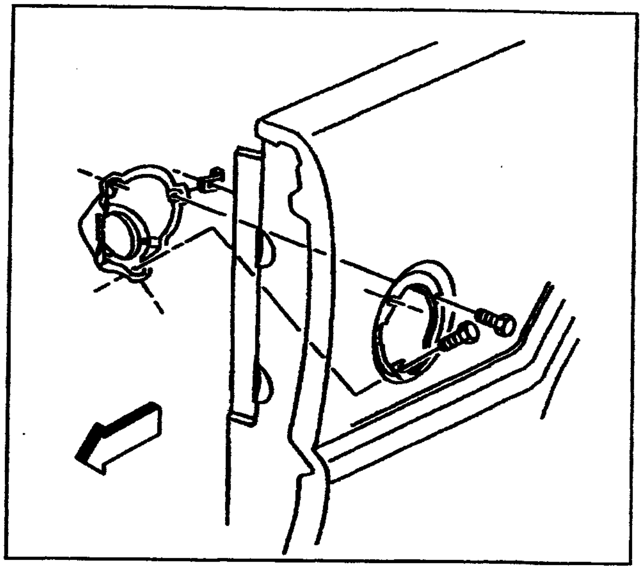


Figure 35—Fuel Filler Pocket

ADHESIVE RETAINED EMBLEM REPLACEMENT

Apply these items in an environment free of dust or dirt that could come in contact with the sticky backing and prevent proper adhesion. Refer to Figures 36 and 37.

1. Clean the area where the emblem is to be mounted. Use a suitable solvent such as a mixture of 50 percent isopropyl alcohol and 50 percent water or an equivalent mixture. Dry the area thoroughly.
2. The body area must be at a temperature range of 27°C to 41°C (80°F to 105°F). Heat the area if necessary.
3. The emblems must be at a temperature range of 29°C to 32° C (85°F to 90°F). Place the emblem, adhesive side down, on a heated surface or use a heat lamp or heat gun.
4. Remove the protective liner on back of emblem. Refer to Figures 36 and 37.

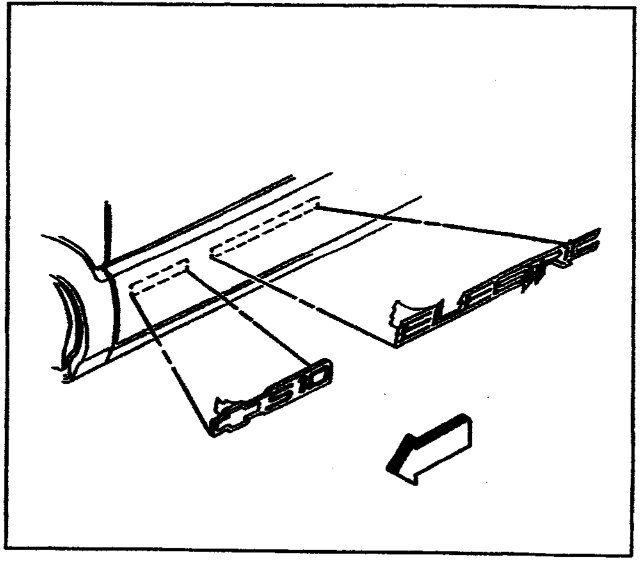


Figure 36—Adhesive Door Emblems

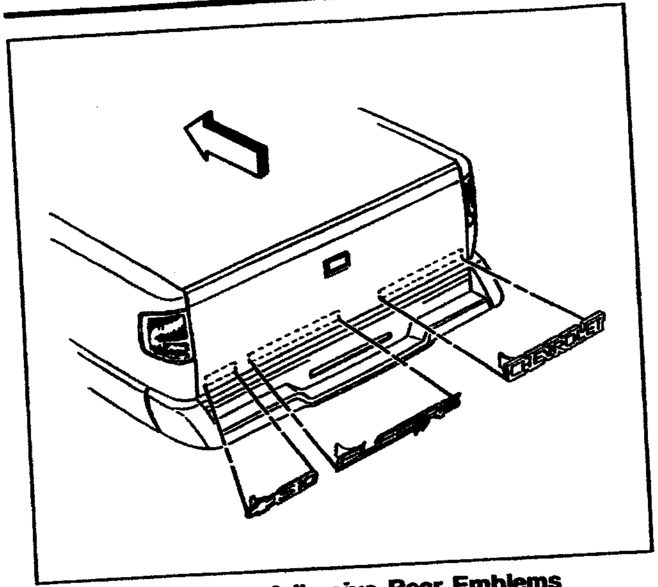


Figure 37—Adhesive Rear Emblems

5. Apply the emblem to the body surface.
6. Apply equal pressure along the item to uniformly bond it to the body surface.

ROOF JOINT MOLDING REPLACEMENT

Remove or Disconnect (Figure 38)

Tools required:
J 25070 Heat Gun

1. Remove the roof joint molding.
   A. Using a heat gun, apply heat to molding and surrounding sheet metal to 82°C to 93°C (180°F to 200°F).

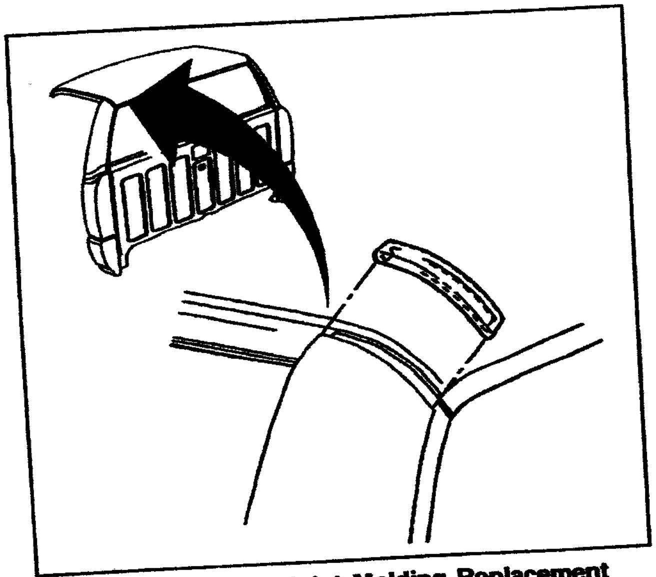


Figure 38—Roof Joint Molding Replacement

   B. Pry off molding between sealer and joint using a flat-bladed tool. Pliers or a similar tool may be used for adequately grasping the hot molding to pull it loose. Molding and sealer should come off of body in one piece. Care should be taken to prevent paint damage on cab.

Clean

- Clean the joint to remove any remaining sealer that would interfere with the replacement molding fit.

Install or Connect (Figure 38)

Tools required:
J 25070 Heat Gun

NOTICE: ***If molding is painted prior to installation, care should be taken to ensure that paint does not coat bottom of sealer.***

1. Install the roof joint molding.
   A. Using a heat gun, apply heat to cab in joint area and preheat sheet metal to approximatel 93°C (200°F).
   B. Install molding into joint area and preheat shee metal to melt sealer and bond molding into joint Sealer begins to flow at approximately t 93°C (200°F).

PRESSURE RELIEF VENTILATION VALVE ASSEMBL REPLACEMENT

Remove or Disconnect (Figure 39)

1. Remove the pickup box. Refer to Pickup Bc Replacement in this section.

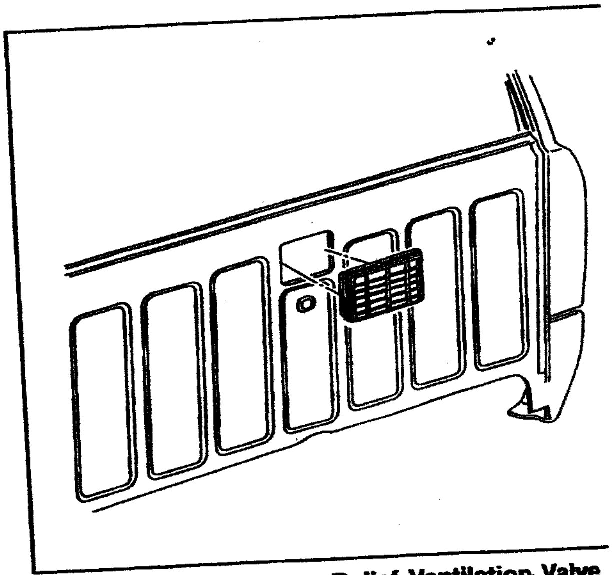


Figure 39—Pressure Relief Ventilation Valve Assembly

2. Remove the pressure relief ventilation valve assembly.
   - Use flat-bladed tool to carefully pry valve out of the rear of cab.

Install or Connect (Figure 39)

1. Install the pressure relief ventilation valve assembly.
   - Firmly press valve into rear of cab.
2. Install the pickup box. Refer to Pickup Box Replacement in this section.

CAB/BOX SEAL REPLACEMENT

Remove or Disconnect

1. Remove the box. Refer to Pickup Box Replacement in this section.
2. Remove the old seal. Clean old adhesive off cab with rubbing alcohol.

Install or Connect

1. Peal paper from adhesive strip on seal.
2. Press seal to cab firmly.
3. Install the box. Refer to Pickup Box Replacement in this section.

PICKUP BOX REPLACEMENT

Remove or Disconnect (Figure 40)

1. Lower the spare tire.
2. Remove the rear tail lamp assemblies. Refer to Lighting Systems.
3. Remove the rear bumper end caps. Refer to Frame and Bumpers.
4. Remove the frame-to-pickup box bolts.
5. Remove the wiring harness ground wire from the frame.
6. Remove the license plate lamp. Refer to Lighting Systems.
7. Remove the fuel filler neck-to-pickup box ground wire.
8. Remove the fuel filler neck-to-pickup box screws.
9. Remove the pickup box from the vehicle.

Install or Connect (Figure 40)

1. Install the pickup box to the vehicle.
2. Install the fuel filler neck-to-pickup box screws.
3. Install the fuel filler neck-to-pickup box ground wire.
4. Install the license plate lamp. Refer to Lighting Systems.
5. Install the wiring harness ground wire to the frame.
6. Install the pickup box-to-frame bolts.

Tighten

- Tighten the pickup box-to-frame bolts to 70 N.m (52 lb ft).

7. Install the rear bumper end caps. Refer to Frame and Bumpers.
8. Install the rear tail lamp assemblies. Refer to Lighting Systems.

BODY MOUNT REPLACEMENT

When changing body mounts, it is critical to properly support the frame while changing the mount. If only one mount is to be changed, the entire side on which the mount is placed must be lowered enough to provide clearance for the mount.

Shims are available in 1.5 mm (0.05 in) and 3.00 mm (0.11 in) sizes and are used to level the body. The shim stack should not exceed 6.0 mm (0.24 in).

Remove or Disconnect (Figures 41 and 42)

1. Raise the vehicle slightly on the hoist.
2. Place jack stands under the body on the side of the vehicle where the mounts will be replaced.
3. Remove the body mount bolts.
4. Remove the retainer.

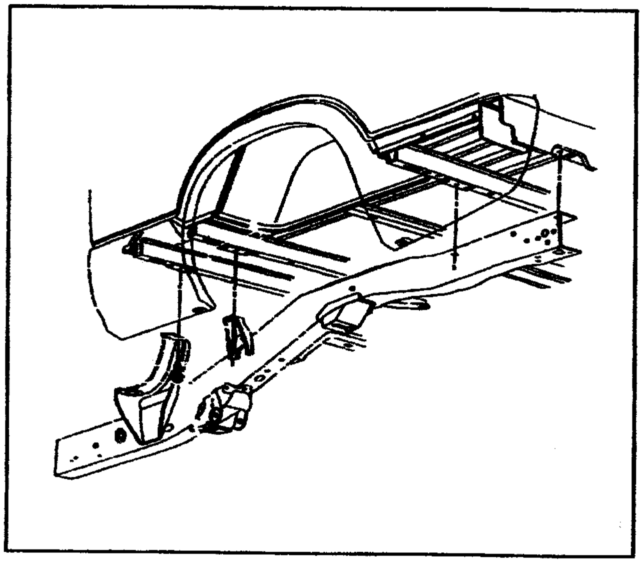


Figure 40—Pickup Box

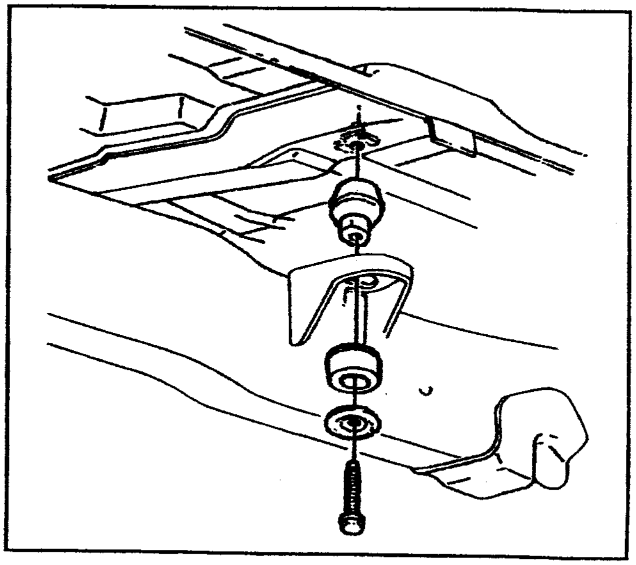


Figure 41—Typical Body Mount

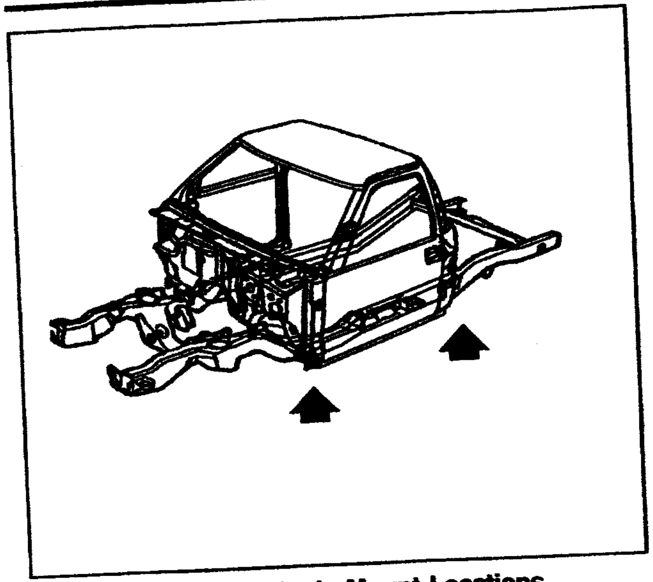


Figure 42—Body Mount Locations

5. Remove the lower cushion.
   - Lower the hoist enough to leave the body supported by the jack stands.
6. Remove the upper cushion.
7. Remove the shims (if equipped).

Install or Connect (Figures 41 and 42)

1. Install the shims (if required).
2. Install the upper cushion.
   - Raise the frame slightly on the hoist.
3. Install the lower cushion.
4. Install the retainer.
5. Install the body mount bolts.
6. Remove the jack stands.

Tighten

- Tighten the body mount bolts to 70 N·m (52 lb ft).

7. Lower the hoist.

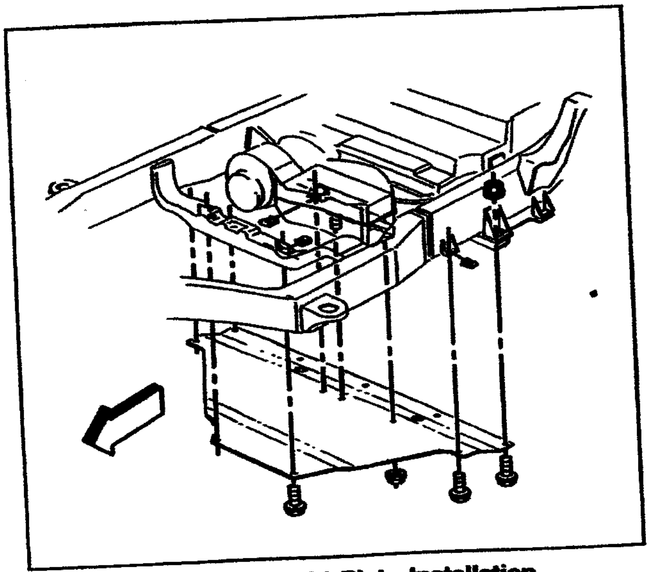


Figure 43—Skid Plate Installation

SKID PLATE REPLACEMENT

Remove or Disconnect (Figure 43)

1. Raise the vehicle on a hoist.
2. Remove two nuts securing the Battery Thermal Module (BTM) to the skid plate.
3. Remove the bolt securing the skid plate to the torsion bar rear support.
4. Remove the LH and RH bolts attaching the skid plate to the FFH crossmember.
5. Remove the LH and RH bolts attaching the skid plate to the frame.
6. Remove the LH and RH bolts and nuts attaching the skid plate to the battery pack.
7. Remove the skid plate.

Install or Connect (Figure 43)

1. Install the bolt securing the skid plate to the torsion bar rear support.

Tighten

- Tighten the bolt to 50 N·m (37 lb ft).

2. Install the LH and RH bolts attaching the skid plate to the FFH crossmember.

Tighten

- Tighten the bolts to 50 N·m (37 lb ft).

3. Install the LH and RH bolts attaching the skid plat to the frame.

Tighten

- Tighten the bolts to 50 N·m (37 lb ft).

4. Install the LH and RH bolts and nuts attaching th skid plate to the battery pack.

Tighten

- Tighten the bolts to 75 N·m (55 lb ft).

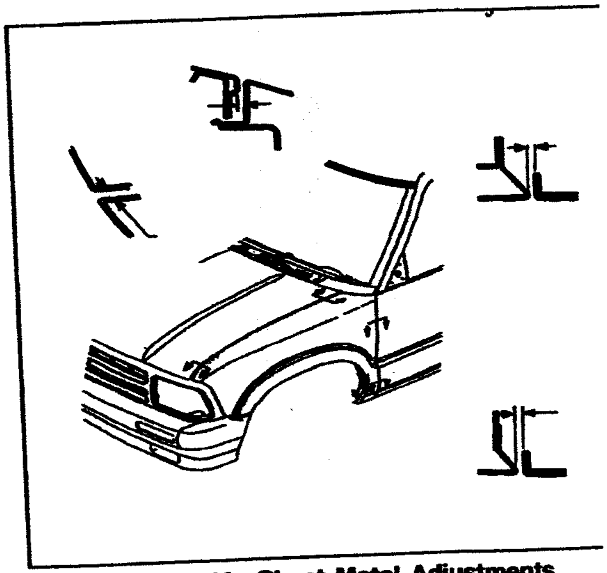


Figure 44—Sheet Metal Adjustments

5. Install two nuts securing the Battery Thermal Module (BTM) to the skid plate.

Tighten

- Tighten the nuts to 5 N.m (44 lb in).

6. Lower the vehicle.

SHEET METAL ADJUSTMENTS

When aligning sheet metal, start at the fenders where they meet the front edge of the doors and work towards the front of the vehicle (Figure 44).

Align each fender so the rear edge of the fender is within 5.0 ± 1.0 mm (0.19 ± 0.04 in) and parallel to the door. Align each side edge within 5.0 ± 1.0 mm (0.20 ± 0.04 in). If it is difficult to center the hood, or the hood appears to be out of square, the front end sheet metal may need to be adjusted as a unit.

To adjust the front end sheet metal as a unit, loosen the radiator support retaining bolts. Lightly push the sheet metal into its proper position and tighten the radiator support bolts.

ANTI-CORROSION TREATMENT

This vehicle was designed and built to resist corrosion. Application of additional rust-inhibiting materials is not necessary or required under the 6 year/100,000 mile corrosion coverage.

- Some after-market rust proofing may create a potential environment that reduces the corrosion resistance designed and built into this vehicle.
- Depending upon application technique, some after-market rust proofing could result in damage or failure of some electrical or mechanical systems on the vehicle.
- Repairs to correct damage or malfunctions caused by after-market rust proofing are not covered under any of the GM new vehicle warranties.

SHEET METAL REPAIR

To help prevent rust, special anti-corrosion materials are used on interior surfaces of metal panels. These materials include special metals such as one-sided and two-sided galvanized, zincro-metal, and zinc-iron alloy steels. These specially treated metals are used in fenders, doors, quarter panels, rocker panels, floor pans, and other critical areas.

Spray-on materials such as zinc-rich primers and waxes are also applied to interior surfaces. These are mainly used in areas where moisture might gather. Sealers are applied along exposed joints. Moisture-repelling asphaltic sound deadeners are applied inside wheel wells, doors, and on some underbody parts.

If these special treatments are disturbed while repairing damaged areas, then the metals may be left unprotected, which could lead to corrosion. Therefore, these surfaces should be recoated with service-type anti-corrosion materials.

Steps for applying anti-corrosion materials should be:

1. **Cleanup and Preparation**

   Depending on the location of the area, sandblasting, scraping, wire brushing, sandpaper, and steel wool can be used to remove residue.

2. **Applying Primer Coats**

   All bare metal must be primed with an acrylic chromate material.

3. **Applying Sealers**

   All flange joints, overlap joints, and seams should be sealed with a medium-bodied consistency sealer that stays flexible and is paintable.

   All open joints that require bridging of sealer to close a gap should take a heavy-bodied caulking material.

4. **Applying Color**

   If areas such as underbody, hem flanges, exposed joints, and engine compartment need buildup and color application procedures, rubbing out and extensive sanding of the undercoats is not necessary.

5. **Applying Deadeners**

   Use a heavy-bodied undercoat with a rubberized or asphaltic base. Areas for application can be determined by original production application.

6. **Applying Anti-corrosion Material**

   Use a light-bodied material designed to penetrate between close metal-to-metal surfaces such as pinch weld joints, hem flanges, and other attaching points where metal surfaces are difficult to coat with conventional materials.

7. **Conventional Undercoating**

   Apply conventional undercoating to large areas such as doors, hoods, fenders, etc. Use care not to spray material into door hardware such as locks, run channels, and window regulators.

   On the underbody, the material should not be applied to any moving or rotating parts.

   After undercoating, make sure that all body drain holes are open.

DINGING AND FINISHING

Paint is quickly scuffed off sharp dents leaving metal exposed to rusting and corrosion, therefore, damaged panels should be repaired as soon as possible. Repair damaged panels by forcing outward in the direction opposite to the force that caused the damage. In this way, metal strains that began when the damage occurred are relieved.

The importance of proper metal finishing to produce a fairly smooth surface should not be underestimated. The application of a hammer directly to a panel tends to stretch the metal and cause a great deal of unnecessary work. Whenever possible, a spoon should be used under the hammer when bumping a panel.

PAINT

SHEET METAL REFINISHING BASECOAT/CLEARCOAT

CAUTION: Many paint repair systems require additives containing isocyanates. It is essential that all recommendations and warnings listed on the container label for these materials, be followed. It is mandatory that adequate respiratory protection such as air line respirators with a full hood be worn. Such protection should be worn during the entire paint process. Persons with respiratory problems or those allergic to isocyanates must not be exposed to isocyanates vapors or spray mist.

Paint Color Codes

Body and trim paint color information is shown on the service parts identification label. Refer to General Information.

Clearcoat Repair Without Refinishing

If the damage or imperfection can be sanded or polished without reaching the basecoat, you do not have to repaint.

1. Thoroughly wash repair area with mild detergent and water.
2. Apply small amount of medium to fine machine rubbing compound to repair area and smear evenly with compounding pad.
3. With polisher running at approximately 1,700 RPM, polish repair area. Keep pad flat against panel assembly while applying light pressure. Feature lines and panel assembly edges should be done with care.
4. If sanding is not required, proceed to Step 9.
5. If repair is near adjacent panel assemblies, mask adjacent panel assemblies to protect against sand scratches and burn through of panel assembly edges.
6. Saturate a piece of micro-fine sandpaper of 1,500 to 2,000 grit in a container of water and attach to sanding pad. Adding a small amount of liquid detergent to water will improve wet-out and sanding performance.
7. Keep repair area wet while sanding. Sand lightly and evenly in one direction only, using straight strokes.

Adjust

- Frequently wipe or squeegee repair to determine when defect has been removed. Sand only enough clearcoat to remove defect. Sanding below clear coat requires repainting.

8. Using clean cloth, wipe repair area clean of water and clearcoat residue.
9. Polish as necessary. Often hand compounding and polishing of a small repair area is all that is necessary to restore appearance.
    - Keep pad flat and allow weight of polisher to do the work.
    - Use polish sparingly to achieve original shine.
    - Machine or hand polish repair area first, then blend in with rest of panel assembly.

Basecoat/Clearcoat Preparation

1. Wash area with detergent and water.
2. Clean area with a silicone, wax and grease remover.
3. Repair and feather-edge damage areas.
4. Treat metal surface with conditioner and conditioner conversion coating. Allow to dry.
5. Apply primer-surfacer. Dry 20 to 30 minutes.
6. Sand basecoat paint with 400 grit or finer paper. (For clearcoat only, wet sand with 600 grit or finer or hand compound).
7. Clean area with a silicone, wax and grease remover. Tack wipe area after cleaning.

Important

- Do not perform Step 8 if basecoat enamel used does not require it. Always refer to manufacturer's label directions.

8. Apply one or two coats of adhesion promoter:
    - Within molding or break lines.
    - Onto one adjacent panel assembly 100 to 150 mm (4-6 in) if repair is not confined and beyond area to be covered by clearcoat.
    - Allow to flash at least 30 minutes before applying clearcoat.

Basecoat Application

1. Activate enamel material per manufacturer's instructions.
2. Mix thoroughly.
3. Reduce basecoat per manufacturer's instructions.
4. Check viscosity with a Zahn number 2 viscosity cup or equivalent.
5. Spray two or more medium-wet coats, 15 to 20 minutes apart, to achieve full-hiding and color match.
6. Cure per manufacturer's instructions.

Clearcoat Application

1. Activate materials per manufacturer's instructions.
2. Mix thoroughly.
3. Reduce clearcoat per manufacturer's instructions.
4. Check viscosity with a Zahn number 2 viscosity cup or equivalent.
5. Spray at 50 psi gun pressure. Apply two medium coats, 15 to 20 minutes apart.
    - Cover entire panel assembly whenever possible.
    - When there are no break lines, blend spray within area prepared.

Important

- Clean spray equipment immediately after use with lacquer thinner.

INDUSTRIAL FALLOUT (ACID RAIN AND RAIL DUST)

Important

- The following information regards the use of finesse-type repairs to industrial fallout (acid rain) and rail dust damage of basecoat/clearcoat paint finishes.

Since the severity of the condition varies from area to area, proper diagnosis of the damage extent is critical to the success of the repairs. Diagnosis of the damaged area should be performed under high-intensity fluorescent lighting, on horizontal surfaces (hood assembly, roof panel assembly, pickup box floor panel assembly) after they have been properly cleaned.

There are three types of acid rain damage:

- Surface level contamination—may be repaired by simply washing the vehicle, cleaning the surface with a silicone wax and grease remover, neutralizing acidic residue and finesse polishing.
- Clearcoat etching—slight etching still noticeable after the above washing and finesse polishing procedure.
- Basecoat etching—severe etching beyond the clearcoat into the basecoat.

Surface Level Contamination

1. Wash vehicle with standard car detergent and water. Dry thoroughly.
2. Clean affected area with a wax and grease silicone remover.
3. Neutralize leftover acidic residue by cleaning damaged areas with a mixture of baking soda and water (one tablespoon per one quart of water), thoroughly rinse and completely dry panel assemblies.
4. Apply finesse-type polish with foam pad.
    - If damage has been repaired, remove any swirl marks with a dual-action orbital polisher and foam pad.
    - If some damage remains, refer to Slight Clearcoat Damage—Wet Sanding in this section.

Slight Clearcoat Damage—Wet Sanding

1. Select small test area on damaged panel assembly.
2. Wet sand the damaged area with an American grade ultra-fine sandpaper of 1,500 to 2,000 grit and rubber sponge sanding block. During wet sand process:
    A. Use ample amounts of water mixed with a mild liquid detergent.
    B. Go slow to prevent removing too much clearcoat.

Important

- Be sure to use American grade sandpaper. European grade sandpaper has a P before the grit number. The European grit rating system is not the same as the American grit rating system.

3. Remove excess water with rubber squeegee and inspect area.
    - If wet sanding has repaired the damage, continue the sanding procedure on the entire panel assembly. Apply a finesse-type polish with a foam pad and remove any swirl marks with a dual-action orbital polisher and foam pad.
    - If during the repair it is suspected or observed that etching has penetrated into the basecoat, too much clearcoat has been removed during sanding or base color is transferred to pad during polishing, the affected areas may require clearcoat/basecoat application or refinishing. Refer to Sheet Metal Refinishing-Basecoat/Clearcoat, Flexible Plastic Part Refinishing, and/or Rigid Plastic Part Refinishing in this section.
4. Polish entire vehicle after all damage has been repaired.

Clearcoat Thickness

The clearcoat on the vehicle is typically .059 to .078 mm (0.0015 to 0.0020 in) thick.

Paint Gauges

The best way to accurately measure how much clearcoat has been removed is to use a paint gauge before, during and after the sanding process. Paint gauges measure the total thickness of the finish and when used, can determine how much clearcoat has been removed during the repair process. Paint gauges range from magnetic pull types to sophisticated electronic types and are available from a variety of sources.

Rail Dust Damage Repair

CAUTION: Rail dust remover (oxalic acid) is an acidic substance containing chemicals that will break down the iron particles embedded in the finish. When working with it, use the necessary safety equipment, including gloves and goggles. Closely follow the manufacturer's directions. Rail dust remover may require special handling and disposal.

Rail dust damage comes from tiny dust particles produced from the friction between the train wheels and the track. Rail dust can also be deposited on vehicles if stored near any operation producing it (i.e., steel ore yards). This dust can either lay on top of, or embed into the paint surface. It is usually diagnosed as bumps in the paint surface or rust colored spots in the paint.

1. Wash vehicle with soap and water. Dry it and clean affected area with a silicone wax and grease remover.
2. Rinse surface with cold water, keeping vehicle in a cool shaded area.
3. Soak several terry cloth towels in container of rail dust remover solution and lay them on damaged areas after vehicle has been rinsed with cold water.
4. Allow towels to remain in place for 20 minutes, keeping them moist by spraying with water and not allowing the solution to dry on the surface of vehicle.

5. After 20 minutes of applying towels, remove them and thoroughly rinse area with cold water. Inspect affected area to ensure dust has been removed. Use both touch (feeling for a bumpy surface) and sight (magnifying glass for close inspection).
6. If, upon inspection, some particles are still present repeat the towel application process. The process of applying towels can be repeated three times.
7. Select test area and wet sand by hand with American grade ultra fine 1,500 to 2,000 grit sand paper to repair damage (surface pitting from dust). Use ample amounts of water and go slow to prevent removing too much clearcoat.

NOTICE: ***Use a paint gauge to determine if too much clearcoat has been removed. If too much has been removed, additional clearcoat must to be applied.***

Important

- If rail dust has penetrated into basecoat, the panel assembly requires refinishing. Make sure all rail dust has been removed prior to refinishing or the rust spots will return.

Preventing Industrial Fallout Damage

To prevent industrial fallout (acid rain) damage, customers should be urged to wash and dry their vehicles frequently and garage them, or cover them with a quality car cover when not in use.

Vehicles in dealer inventories should be kept clean and dry. A vehicle that sits unattended, especially after the sun has dried any water on the body surface, is a target for acid rain damage.

FLEXIBLE PLASTIC PART REFINISHING

To refinish repaired flexible parts, it is very important to follow the paint manufacturer's system regarding preparation, priming, and refinishing. Because these parts are flexible they may require special additives in the primers and topcoat to prevent cracking and poor adhesion. Always use the manufacturer's recommended materials and never mix with other systems.

RIGID PLASTIC PART REFINISHING

To refinish repaired rigid parts, it is very important to follow the paint manufacturer's directions regarding preparation, priming and refinishing. Some TEO (EP, EPM, TPO) rigid parts require special polypropylene primers for adhesion. Always use manufacturer's recommended materials and never mix with other systems.

ANTI-CHIP COATING REPLACEMENT

The rocker panels were treated with a chip-resistant coating before the colorcoat application. When these areas are being repaired, the anti-chip coating should be applied before the paint.

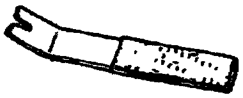
1. Remove the old paint and special coating from the panels.
2. Sand the area smooth.
3. Apply primer to the surface.
4. Mix the anti-chip material such as Immont R-M 891 or PPG Roadguard DX-54 or equivalent following the manufacturer's directions.
5. Apply 4 to 6 coats of the mixture with a feed gun. Follow manufacturer's directions for gun pressure and drying time.
6. Apply paint.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N.m	Lb Ft	Lb In
Air Deflector to Fascia Bolts	6	—	53
Air Deflector to Frame Bolts	32.5	24	—
Battery Tray to Radiator Support Bolts	29	21	—
Bumper End Cap to Frame Nuts	1.6	—	14
Cab Mount Bolts	70	52	—
Fender Bolts	29	21	—
Fuel Filler Door Bolts	1.9	—	17
Fuel Filler Pocket Bolts	6	—	53
Hood Hinge Nuts	25	18	—
Hood Release Cable Bolts	9	—	80
Latch Support to the Radiator Support Bolts	25	18	—
Pick-up Box-to-Frame Bolts	70	52	—
Plenum Seal Screws	1.9	—	17
Primary Hood Latch-to-Mounting Bracket Bolts	25	18	—
Primary Hood Latch Support Bracket-to-Mounting Bracket Bolts	25	18	—
Radiator Grille Screws	1.4	—	12
Radiator Support-to-Frame Bolts	70	52	—
Secondary Hood Latch Bolts	25	18	—
Vent Grille-to-Cowl Screws	1.5	—	13
Wheelhouse Panel Bolts	29	21	—
Wheelhouse Panel-to-Support Bolts	27	20	—

SPECIAL TOOLS

1.

J 38778

2.

J 8966

3.

J 25070

1. DOOR TRIM PAD AND GARNISH CLIP REMOVER
2. WINDSHIELD WIPER ARM REMOVER AND INSTALLER
3. HEAT GUN

2902R2093

SECTION 10A7

ENDGATE

GENERAL DESCRIPTION

The pickup box endgate is hinged at the base of the endgate opening. There is a latching mechanism within the endgate which is activated by the endgate latch handle at the center of the endgate. The endgate is supported in the open position by two cables attached to the pickup box and the endgate.

NOTICE: *A visual/functional check of all parts removed or replaced should be performed that involves sealing the endgate. This inspection should take place before and after the repair to insure compliance with original sealing specifications.*

ON-VEHICLE SERVICE

PICKUP BOX ENDGATE REPLACEMENT

←→ **Remove or Disconnect (Figures 1 and 2)**

1. Right and left pickup box endgate cables from the endgate striker bolts.
   - A. Open the endgate and safely support it.
   - B. Disconnect the slotted hole at the end of the cable from the endgate striker bolt.
2. Endgate from the vehicle.
   - A. Raise the endgate to a 45 degree angle. Do not pinch the cable between the endgate and pickup box.
   - B. Lift the endgate from the left side hinge first and then from the right side hinge.

→← **Install or Connect (Figures 1 and 2)**

1. Endgate to the vehicle.
   - A. Install the endgate to the right side hinge first.
   - B. While holding the endgate at a 45 degree angle, seat the endgate to the left side hinge.
2. Right and left pickup endgate cables to the endgate striker bolts.

PICKUP BOX ENDGATE HINGE REPLACEMENT

←→ **Remove or Disconnect (Figures 3 and 4)**

1. Endgate. Refer to Pickup Box Endgate Replacement in this section.
2. Bolts that retain the pickup box endgate hinges to the endgate.

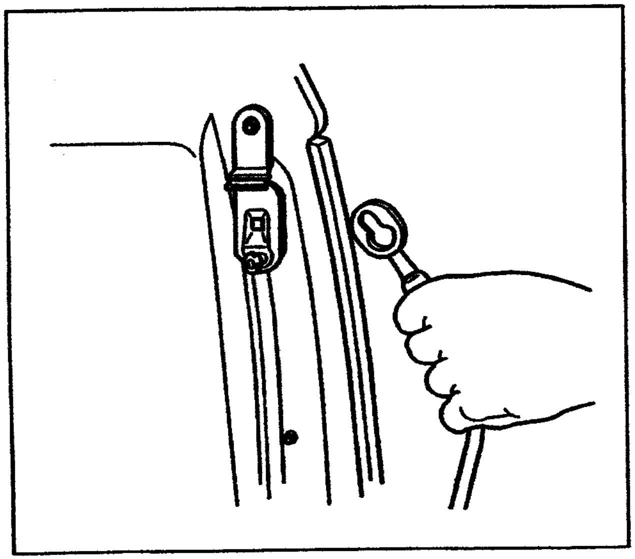


Figure 1—Pickup Box Endgate Cable

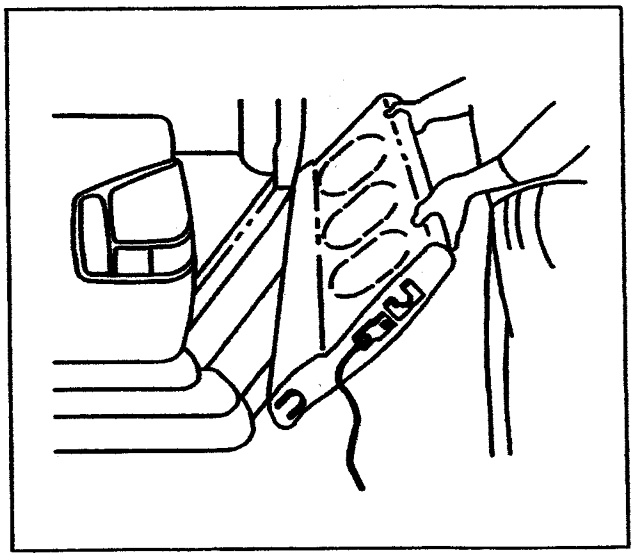


Figure 2—Pickup Box Endgate

3. Pickup box endgate hinges from the endgate.
4. Bolts that retain the pickup box endgate hinges to the pickup box.
5. Pickup box endgate hinges from the pickup box.

Install or Connect (Figures 3 and 4)

1. Pickup box endgate hinges to the pickup box.
2. Bolts that retain the pickup box endgate hinges to the pickup box.

Tighten

- Bolts to 25 N.m (18 lb ft).

3. Pickup box endgate hinges to the endgate.
4. Bolts that retain the pickup box endgate hinges to the endgate.

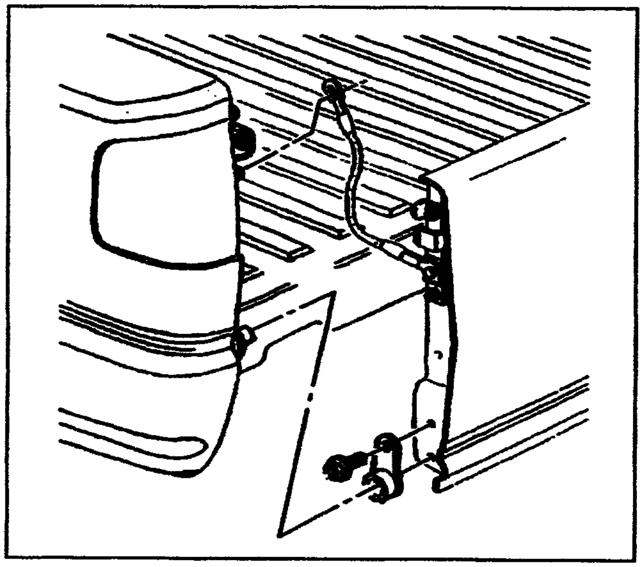


Figure 3—Pickup Box Endgate Hinge (Endgate Side)

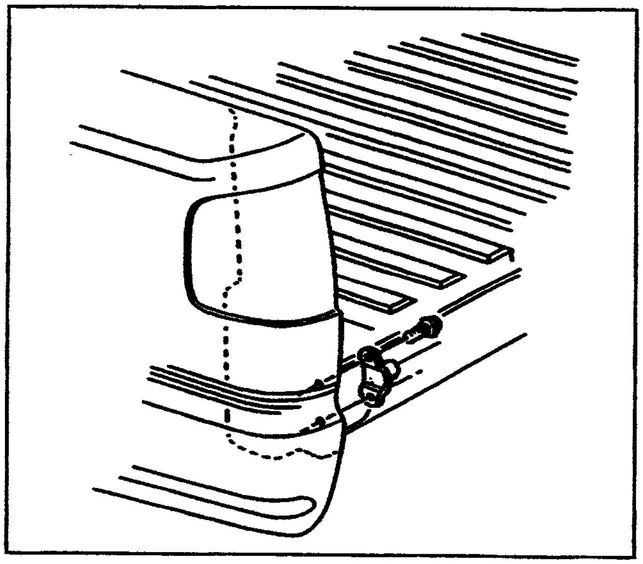


Figure 4—Pickup Box Endgate Hinge (Pickup Box Side)

Tighten

- Bolts to 25 N.m (18 lb ft).

5. Endgate. Refer to Pickup Box Endgate Replacement in this section.

PICKUP BOX ENDGATE STRIKER REPLACEMENT

Remove or Disconnect (Figure 5)

1. Tail lamp. Refer to Taillamp and Bulb Replacement in Lighting Systems.
2. Pickup box endgate cable from the striker bolt.
   A. Open the endgate and safely support it.
   B. Disconnect the slotted hole at the end of the cable from the endgate striker bolt.
3. Nuts and bolts that retain the pickup box endgate striker to the vehicle.
4. Pickup box endgate striker from the vehicle.

Install or Connect (Figure 5)

1. Pickup box endgate striker to the vehicle.
2. Nuts and bolts that retain the pickup box endgate striker to the vehicle.

Tighten

- Bolts to 25 N.m (18 lb in).

3. Pickup box endgate cable to the endgate striker bolt.
4. Tail lamp. Refer to Taillamp and Bulb Replacement in Lighting Systems.

PICKUP BOX ENDGATE LATCH HANDLE REPLACEMENT

Remove or Disconnect (Figures 6 and 7)

1. Pickup box endgate latch handle bezel.
   - Carefully pry out the bezel from the top using a flat-bladed tool.

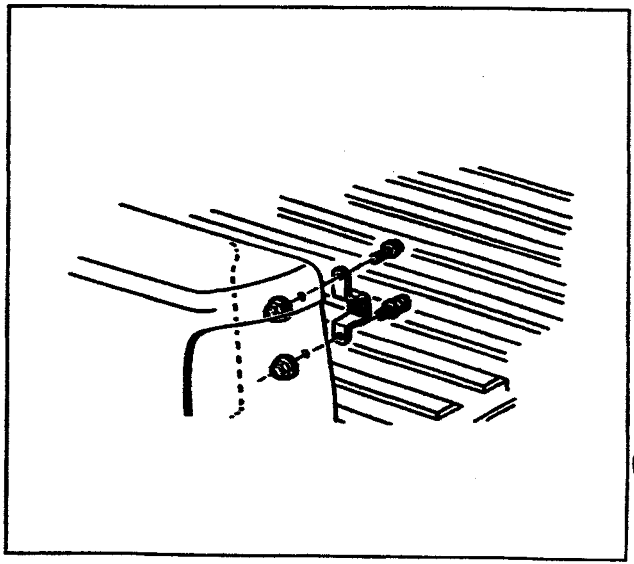


Figure 5—Pickup Box Endgate Striker

2. Endgate latch rods from the endgate latch handle.
   A. Separate the retaining clip from the lower latch rod by prying the clip apart at the head of the latch rod.
   B. Slide the lower latch rod from the retaining clip and the handle.
   C. Lift the endgate latch handle to gain access to the upper latch rod retaining clip and separate it from the upper latch rod.
   D. Slide the upper latch rod from the retaining clip.
3. Bolts that retain the pickup box endgate latch handle to the endgate.
4. Pickup box endgate latch handle from the endgate.

Install or Connect (Figures 6 and 7)

1. Pickup box endgate latch handle to the endgate.
2. Bolts that retain the pickup box endgate latch handle to the endgate.

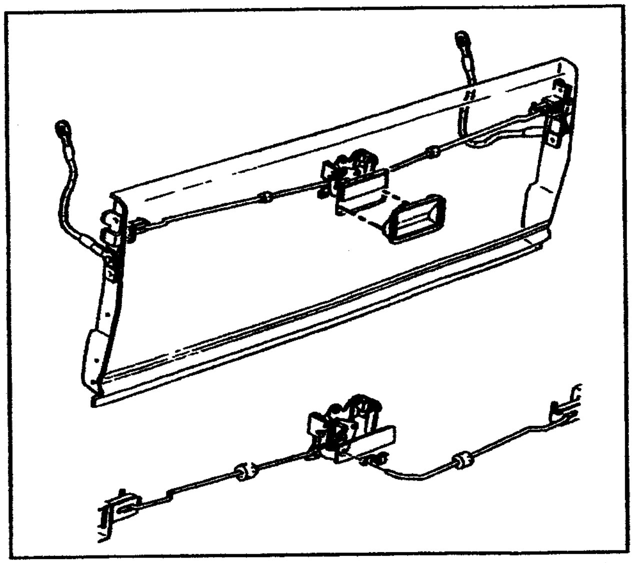


Figure 6—Pickup Box Endgate Handle and Latch

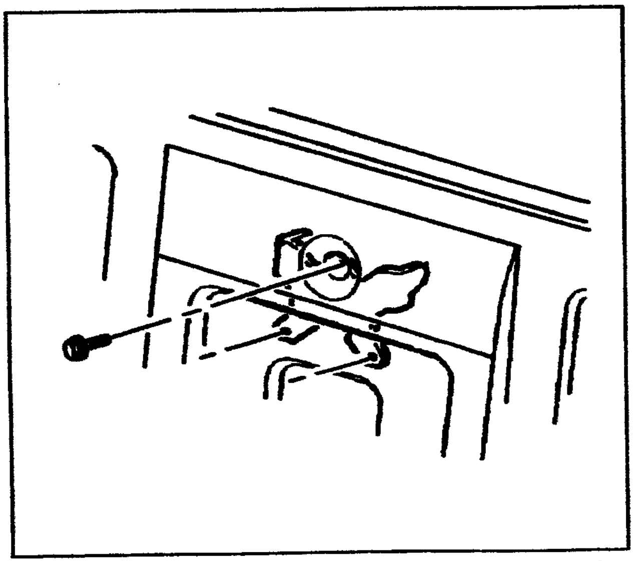


Figure 7—Pickup Box Endgate Latch Handle Bolts

Tighten

- Bolts to 25 N·m (18 lb ft).

3. Upper latch rod to the handle and retaining clip.
4. Lower latch rod to the handle and retaining clip.
5. Pickup box endgate latch handle bezel.
   - Position the bezel and snap it into place.

PICKUP BOX ENDGATE LATCH AND CABLE REPLACEMENT

Remove or Disconnect (Figure 8)

1. Pickup box endgate latch handle bezel.
   - Carefully pry out the bezel from the top using a flat-bladed tool.
2. Open the endgate.
3. Endgate latch rods from the endgate latch handle.
   A. Separate the retaining clip from the lower latch rod by prying the clip apart at the head of the latch rod.
   B. Slide the lower latch rod from the retaining clip and the handle.
   C. Lift the endgate latch handle to gain access to the upper latch rod retaining clip and separate it from the upper latch rod.
   D. Slide the upper latch rod from the retaining clip.
4. Pickup box endgate cables from the endgate striker bolts.
   - Disconnect the slotted hole at the end of the cable from the endgate striker bolt.
5. Bolts that retain the pickup box endgate latches to the endgate.
6. Pickup box endgate latches, cables, and latch rods from the endgate.

Install or Connect (Figure 8)

1. Pickup box endgate latches, cables, and latch rods to the endgate.
2. Bolts that retain the pickup box endgate latches to the endgate.

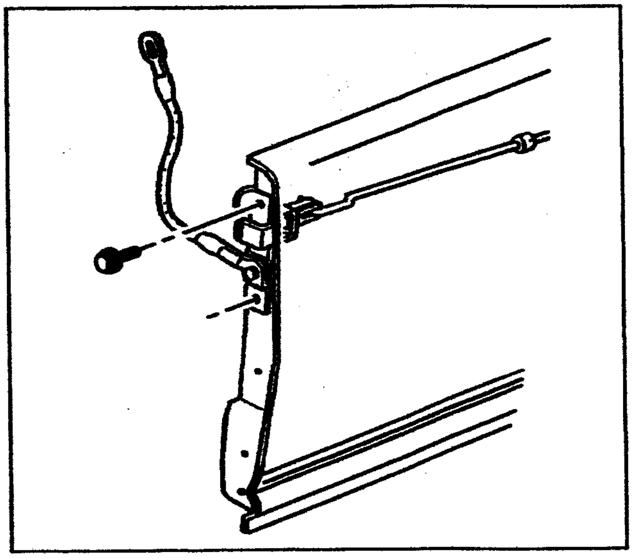


Figure 8—Pickup Box Endgate Latch and Cable

Tighten

- Bolts to 25 N·m (18 lb ft).

3. Pickup box endgate cables to the endgate striker bolts.
4. Upper latch rod to the handle and retaining clip.
5. Lower latch rod to the handle and retaining clip.
6. Pickup box endgate latch handle bezel.
   - Position the bezel and snap it into place.

PICKUP BOX ENDGATE BUMPER REPLACEMENT

Remove or Disconnect (Figure 9)

1. Open the endgate.
2. Pickup box endgate bumper from the vehicle.
   - Grip the endgate bumper and pull out to release the retainers.

Install or Connect (Figure 9)

1. Pickup box endgate bumper to the vehicle.
   - Insert a blunt object into the recessed areas of the bumper and press it in to seat the retainers.

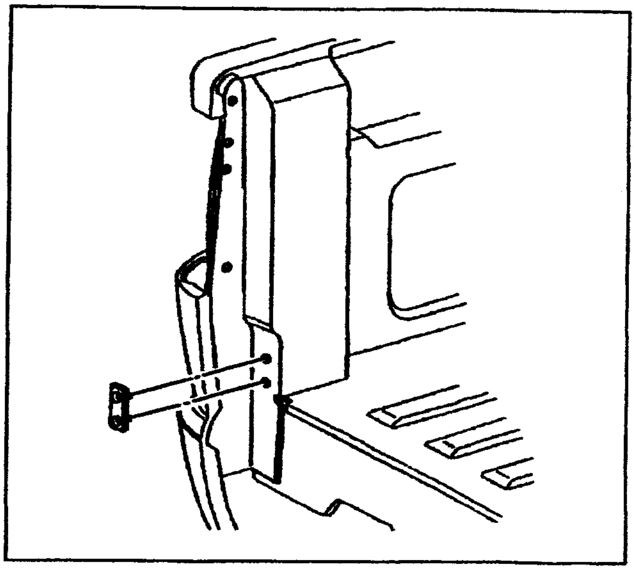


Figure 9—Pickup Box Endgate Bumper

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	N·m	Lb Ft	Lb In
Endgate Bellcrank Bolts	9	—	80
Endgate Cover Screws	1.2	—	11
Endgate Inside Handle Screws	2.8	—	25
Endgate Latch Bolts	10	—	88
Endgate Striker Bolts	22	16	—
Endgate Support Bolts	2.8	—	25
Endgate Torque Rod Bracket-to-Body Bolts	10	—	88
Endgate Torque Rod Insulator-to-Endgate Bolts	25	18	—
Endgate Trim Panel Screws	1.9	—	17
Pickup Box Endgate Hinge-to-Pickup Box Bolts	25	18	—
Pickup Box Endgate Hinge-to-Endgate Bolts	25	18	—
Pickup Box Endgate Striker Bolts	25	18	—
Pickup Box Endgate Latch Bolts	25	18	—
Pickup Box Endgate Latch Handle Bolts	25	18	—

SECTION 10B

CAB AND BODY MAINTENANCE

ON-VEHICLE SERVICE

CLEANING AGENTS

CAUTION: Follow the manufacturer's advice when cleaning agents or other chemicals are used inside or outside the vehicle. Some cleaners may be poisonous or flammable, and improper use may cause personal injury, paint to peel, or damage to components. When cleaning the interior or exterior of the vehicle, do not use the following cleaners except as specifically directed in the fabric cleaning procedures contained in this manual:

- **acetone**
- **alcohols**
- **aliphatic hydrocarbons**
- **aromatic hydrocarbons**
- **bleaches**
- **enamel reducers**
- **esters**
- **ethylene chloride**
- **ketones**
- **lacquer thinners**
- **laundry soaps**
- **methylene chloride**
- **nail polish removers**
- **napthas**
- **penetrating oils**
- **plasticizers**
- **propylene glycols**
- **reducing agents**
- **silicones**
- **tetrachloroethane**

Never use carbon tetrachloride, gasoline, benzene, or naphtha for any cleaning purpose.

Some after market products used to increase the gloss of the instrument panel contain some of the products listed above. It is important to only use those solutions recommended for cleaning the identified surfaces. As a general rule, the following guidelines can be used:

- **Vinyl and Non-painted Plastic - Use vinyl and plastic cleaners.**
- **Rubber - Use rubber cleaners.**
- **Painted Plastic Surfaces - Use only mild detergents.**

Open all vehicle doors for ventilation when any cleaning agents or other chemicals are used inside the vehicle. Overexposure to some vapors, which is more likely to occur in small, unventilated spaces, may result in a health problem.

NOTICE: *To avoid possible permanent discoloration of light colored seats, do not let materials with non-fast colors come in contact with seat trim materials until these materials are totally dry. This includes certain types of clothing, such as colored denims, corduroys, leathers, and suedes.*

Use the proper cleaning techniques and cleaners on the first cleaning to avoid water spots, spot rings, or setting of stains or soilage—all of which are more difficult to remove in a second cleaning.

Remove dust and loose dirt that often collect on interior fabrics with a vacuum cleaner or soft bristle brush. Wipe vinyl trim regularly with a clean damp cloth.

INTERIOR CLEANING

Basic Steps Before Cleaning

1. Remove stains as quickly as possible before they set.
2. Use a clean cloth or sponge. Keep changing to a clean section of the cloth. A soft brush may be used if stains persist.
3. Use solvent-type cleaners in a well ventilated area. Do not saturate the stained area.
4. If a ring forms after spot cleaning, clean the entire area immediately.
5. Follow manufacturer's instructions for all cleaning agents.

General Cleaning of Fabric Trim with Foam Type-Cleaner

Use GM Multi-Purpose Powdered Cleaner or equivalent for this type of cleaning and for cleaning panel sections where small cleaning rings may be left from spot cleaning.

Vacuum and brush the area to remove any loose dirt surrounding trim along stitch or welt lines.

Clean the complete trim panel one section at a time. Mix cleaner following the directions on the container label. Use suds on a clean sponge. Do not saturate the material or rub it harshly. Wipe off remaining residue with a slightly damp absorbent towel or cloth. A heat dryer or heat lamp may be used. Use caution with a heat dryer or lamp to prevent fabric damage.

Spot Cleaning Fabric Trim with Solvent-Type Cleaner

Before trying to remove a spot or stain from fabric, try to determine the type and age of the spot or stain. Some spots or stains can be removed with water or a mild soap solution. Remove spots or stains as soon as possible.

Some stains or soils, such as lipstick, inks and grease, are very difficult (sometimes impossible) to remove completely. When cleaning this type of stain, do not enlarge the soiled area. Use GM Fabric Cleaner (solvent-type) or equivalent to spot clean grease, oil, or fat stains.

Gently scrape excess stain from the trim material. Use very little cleaner, light pressure, and clean cloths, preferably cheesecloth. Start cleaning at the outside of the stain and feather towards the center. Keep changing to a clean section of the cloth.

After the stain has been removed, immediately dry the area with a heat dryer or heat lamp to help prevent a cleaning ring. Use caution with the heat dryer or lamp to prevent fabric damage.

If a ring forms, immediately repeat the cleaning operation over a slightly larger area with emphasis on feathering towards its center. If a ring still remains, mask off the surrounding trim sections, and clean the entire area with GM Multi-Purpose Powdered Cleaner or equivalent as described earlier in this section.

Grease or Oily Stains

The following applies to stains caused by such substances as grease, oil, butter, margarine, shoe polish, coffee with cream, chewing gum, cosmetic creams, vegetable oils, wax crayon, tar, and asphalts:

- Carefully scrape off excess matter, then use GM Fabric Cleaner (solvent type) or equivalent as explained earlier in this section.
- Shoe polish, wax crayons, tar, and asphalts will stain if left on trim; remove them as soon as possible. Use care since the cleaner may cause the stains to "bleed" as it dissolves them.

Non-Greasy Stains

This includes stains from catsup, black coffee, egg, fruit, fruit juice, milk, soft drinks, wine, vomit, blood, and urine.

- Carefully scrape off excess matter, then sponge the stain with cool water.
- If a stain remains, use GM Multi-Purpose Cleaner (foam-type) or equivalent as explained earlier in this section.
- If an odor lingers after cleaning vomit or urine, treat the area with a water/baking soda solution of 5 milliliters (1 teaspoon) of baking soda to 250 milliliters (1 cup) of lukewarm water.
- Finally, if needed, clean lightly with GM Fabric Cleaner (solvent-type) or equivalent.

Combination Stains

This includes stains from candy, ice cream, mayonnaise, chili sauce, and stains of unknown origin. Carefully scrape off excess matter. Clean with cold water and allow to dry.

- If a stain remains, clean it with GM Fabric Cleaner (solvent type) or equivalent.

Cleaning Vinyl Trim

Usually soilage can be removed from vinyl with warm water and mild soap.

Apply a small amount of soap solution and let it soak for a few minutes to loosen the dirt then rub briskly with a clean damp cloth to remove dirt and traces of soap. This may be repeated several times, if needed.

Soilage from such things as tars, asphalts, shoe polish, etc. will stain if left on trim. Wipe off these compounds as quickly as possible and clean the area with a clean cloth dampened with GM Vinyl/Leather Cleaner (solvent-type) or equivalent.

Seat Belt Care

CAUTION: Do not bleach or dye seat belts since this may severely weaken them. Damaged seat belts are a safety hazard.

- **Keep the belts clean and dry.**
- **Clean seat belts with mild soap and lukewarm water only.**

GLASS SURFACES

Glass surfaces should be cleaned on a regular basis. Use GM Glass Cleaner or equivalent to remove normal tobacco smoke and dust films.

A non-abrasive cleaner such as Bon-Ami® or equivalent may be used on the outside of the windshield. Clean wiper blades with a cloth soaked in a solution of one-half water and one-half GM Optikleen® or equivalent. A solution of one-half water and one-half methanol alcohol may also be used. Then rinse the blade with water.

EXTERIOR CLEANING

Washing and Waxing

Wash the vehicle in lukewarm or cold water. Do not use hot water or wash the vehicle in the direct rays of the sun. Do not use strong soap or chemical detergents. All cleaning agents should be promptly flushed from the surface and not allowed to dry on the finish.

Painted body surfaces and chrome plating should be protected by a coating of wax. Any good base body wax can be used for both painted and chrome surfaces. Apply wax immediately after the vehicle has been cleaned. Do not apply wax to the vehicle in direct sunlight or in extreme heat. Periods between applications should be short enough to ensure continuous protection of the finish.

Foreign Material Deposits

Calcium chloride and other salts, ice-melting agents, road oil and tar, tree sap, bird droppings, chemicals from industrial chimneys, and other foreign matter may damage vehicle finishes if left on painted surfaces. Use cleaners that are designed for painted surfaces for these deposits.

Cleaning Bright Metal Parts

Clean bright metal parts regularly with water. Use GM Chrome Polish or equivalent on chrome or stainless steel trim, if necessary.

Use special care with aluminum trim. Do not use auto or chrome polish, steam, or caustic soap to clean aluminum. A coating of wax, rubbed to a high polish, is recommended for all bright metal parts.

Weatherstrip Lubrication

Use silicone grease to lengthen weatherstrip life, to help sealing, and to help eliminate squeaks. Use a clean cloth to apply a thin film of silicone grease to all weatherstrips.

WATER LEAKS

If water has leaked into the interior, test for leak points. Refer to Stationary Windows. Mark the location(s) of any leaks.

Water which appears at a certain place inside the body may actually be entering from another point. It may be necessary to remove the floor mat, insulation, instrument panel, etc. in order to trace the path of the water to the point of entry. If it is still not possible to locate the point of entry, do the following:

1. Close all windows and vents.
2. Cover the air pressure relief valves.
3. Place the air lever in position to use outside air.
4. Turn the fan lever to the HI position.
5. Close the doors.
6. Run a small stream of water over the area suspected of leaking.
7. Check for bubbles, indicating that air is escaping from the interior.

Corrective Measures

If the leak is between body panels, use an air-drying, flexible body-sealing compound to seal area.

If the leak is around a door, it may be because the door is not properly aligned. Refer to Doors and align the door. If the door is contacting the weatherstrip correctly, make sure the weatherstrip is not damaged and is properly seated on the opening flange. If the weatherstrip is damaged, replace it.

DUST LEAKS

Dust will leak into the vehicle where water will not, particularly in the lower portion of the interior. Forward motion of the vehicle can create a slight vacuum which pulls air and dust inside.

To determine the location of dust leaks:

1. Remove the mats and insulation from the floor and kick panel.
2. Drive the vehicle on a dusty road.
3. Examine the interior. Dust in the shape of a small cone or slit will usually be found at the point of leakage.
4. Mark the points of leakage.
5. With the interior of the vehicle darkened, shine bright lamps on the underside of the floor and cowl, and have an assistant check inside for any points where the light shines through. Mark the leakage points. Check weld joints and body mounts.

Sealing of leaks should be done with an air-drying, flexible body-sealing compound.

BLANK

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